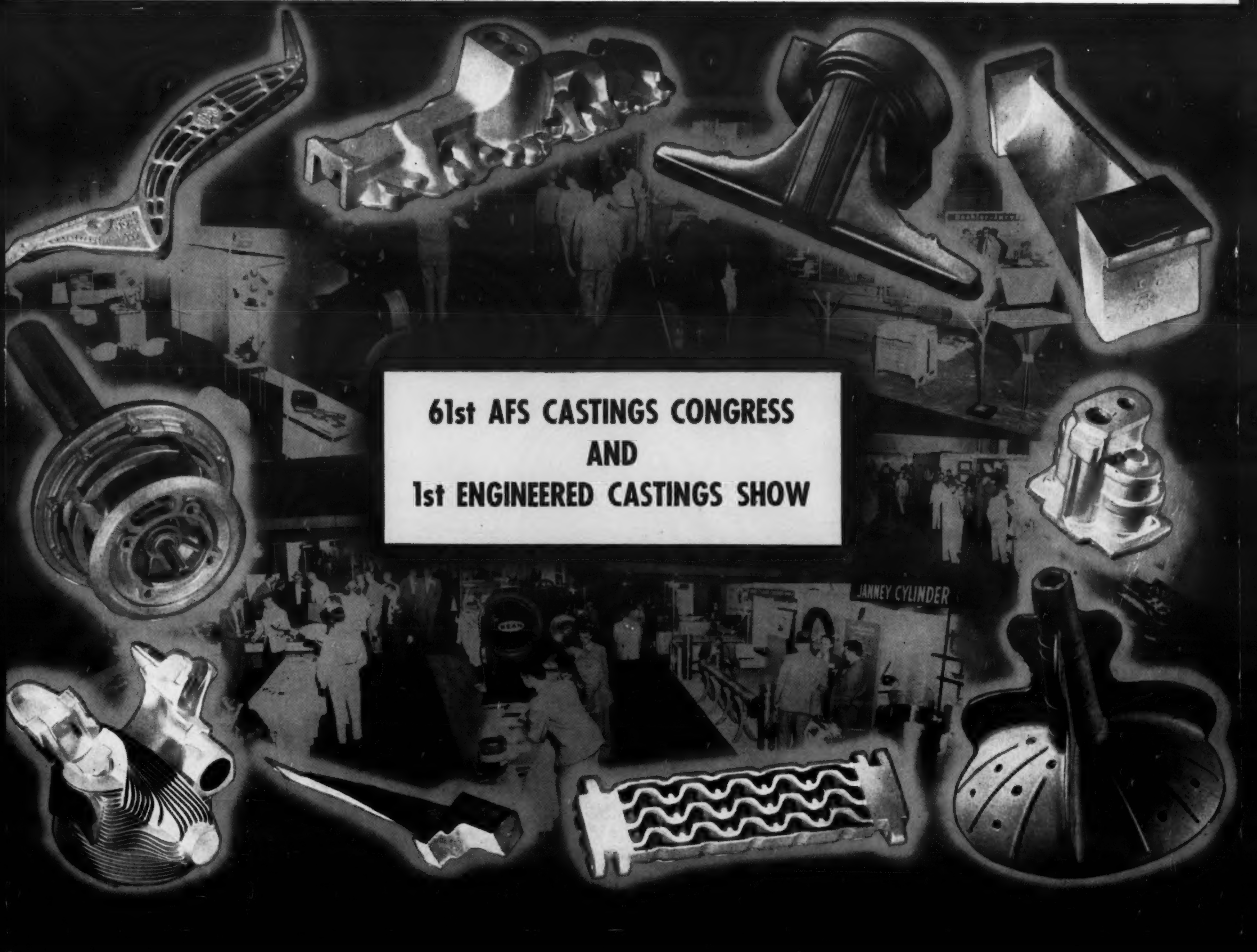
JUNE 1957
AFS CONVENTION REPORT ISSUE

modern castings



61st AFS CASTINGS CONGRESS AND 1st ENGINEERED CASTINGS SHOW

future meetings and exhibits

JUNE

2-6 . . Air Pollution Control Association, *Golden Jubilee Meeting*. Jefferson Hotel, St. Louis.

3 . . AFS Division Executive Committees and Program & Papers Committees, *Annual Review*. Sherman Hotel, Chicago.

4 . . AFS Technical Council, *Annual Meeting*. Sherman Hotel, Chicago.

3-5 . . American Management Association, *General Management Conference*. Hotel Statler, New York.

5 . . AFS Publications Committee, *Annual Meeting*. Sherman Hotel, Chicago.

9-14 . . American Society of Mechanical Engineers, *Semi-annual Meeting*. Sheraton Palace Hotel, San Francisco.

10-11 . . Magnesium Association, *Annual Meeting*. The Homestead, Hot Springs, Va.

11-13 . . *Western Plant Maintenance and Engineering Show*. Civic Auditorium, San Francisco.

13-14 . . AFS *14th Annual Chapter Officers Conference*. Sherman Hotel, Chicago.

13-14 . . Malleable Founders' Society, *Annual Meeting*. The Broadmoor, Colorado Springs, Colo.

13-15 . . Instrument Society of America, *Third National Symposium on Instrumental Methods of Analysis*. University of Chicago, Chicago.

16-21 . . American Society for Testing Materials, *Annual Meeting*. Chalfonte-Haddon Hall, Atlantic City, N. J.

16-29 . . American Material Handling Society, *Fourth Annual Material Handling Training Conference*. Lake Placid Club, Essex County, N.Y.

17-21 . . American Society for Engineering Education, *Annual Meeting*. Cornell University, Ithaca, N. Y.

20-22 . . AFS *2nd Annual Foundry Instructors' Seminar*, Kellogg Center, Michigan State University, East Lansing, Mich.

20-22 . . *Penn State Regional Foundry Conference*. Penn State University, University Park, Pa.

22-25 . . Alloy Casting Institute, *Annual Meeting*. The Homestead, Hot Springs, Va.

27-28 . . Refractories Institute, *Annual Meeting*. The Greenbrier, White Sulphur Springs, W. Va.

28 . . AFS 1958 *Exhibits Committee, Annual Meeting*. Union League Club, Chicago.

JULY

22-23 . . AFS *Finance Committee, Annual Meeting.* Union League Club, Chicago.

AUGUST

8-9 . . AFS *Annual Board Meeting.* Hotel Sherman, Chicago.

19-24 . . *24th International Foundry Congress,* Arranged by Swedish Foundrymen's Association. Parliament Bldg., Stockholm, Sweden.

SEPTEMBER

17-20 . . American Die Casting Institute, *Annual Meeting.* Edgewater Beach Hotel, Chicago.

23-24 . . Steel Founders' Society of America, *Fall Meeting.* The Homestead, Hot Springs, Va.

23-26 . . Association of Iron & Steel Engineers, *Exposition.* Sheraton Hotel, Pittsburgh, Pa.

27-28 . . AFS *Missouri Valley Regional Conference.* Missouri School of Mines and Metallurgy, Rolla, Mo.

OCTOBER

2-3 . . AFS *Michigan Regional Foundry Conference.* Kellogg Center, East Lansing, Mich.

9-11 . . Gray Iron Founders' Society, *Annual Meeting.* Drake Hotel, Chicago.

12-13 . . Conveyor Equipment Manufacturers Association, *Annual Meeting.* Grand Hotel, Point Clear, Ala.

17-18 . . Magnesium Association, *Annual Convention.* The Biltmore, New York.

17-19 . . Foundry Equipment Manufacturers' Association, *Annual Meeting.* The Greenbrier, White Sulphur Springs, W. Va.

18-19 . . AFS *New England Regional Foundry Conference.* Massachusetts Institute of Technology, Cambridge, Mass.

18-19 . . AFS *Northwest Regional Foundry Conference.* Hotel Vancouver, Vancouver, B.C.

21-25 . . National Safety Council . . *45th National Safety Congress and Exposition.* Conrad Hilton Hotel, Chicago.

24-25 . . AFS *Niagara Frontier Regional Foundry Conference.* Statler Hotel, Buffalo, N. Y.

25-26 . . National Management Association, *Annual Meeting.* Penn-Sheraton Hotel, Pittsburgh, Pa.

31-Nov. 1 . . *10th Annual Purdue Metals Casting Conference.* Purdue University, Lafayette, Ind.

Foundry Consumption of Resins Continues to Rise

Synthetic resins are being used at an increasing rate, O. J. Myers, Reichhold Chemicals, Inc., told the audience at the American Foundrymen's Society Eastern Regional Foundry Conference held in April at Philadelphia.

Extremely fast baking, excellent collapsibility, and high strength and hardness are three of the advantages synthetics have over natural products, according to the speaker. Their complete acceptance is retarded by poorer workability, odor during founding, and dermatitis. The use of a parting agent mixture eliminates the workability difficulty but the fact that synthetic resins are made with water as a vehicle rather than petroleum thinners probably precludes their ever reaching the excellent workability of oil bonded sands.

He added that core oils can not match the excellent collapsibility of urea formaldehyde nor the high strength and hardness ratios on a solids level.

Much of the increased use of synthetics is due to the growing popularity of shell molding and shell core making. In addition, considerable experimenting continues on resin coated sands.

Myers pointed out that plastics are finding their way into foundries in applications other than sand bonding. Patterns are being made from epoxy resins and wooden patterns are being coated with shellac and shellac substitutes.

Plastics are used as the binding material in most of the core washes and mold washes. Many core pastes are based upon the resinous binders for their adhesiveness.

Future work on plastics in foundries will be directed along two lines, Myers predicted. One will be the reduction in manufacturing costs, the other will be in further strengthening of the plastics.

Looking into the future the speaker said "We can not be accused of daydreaming when we visualize a resinous slurry being pumped from the mixing tank into enclosed patterns and core boxes, where under a controlled setting time the mold solidifies in a matter of minutes. When this process is perfected, undoubtedly the plastics industry will supply the materials which will form the major part of such a slurry for foundry use."

◄ Circle No. 123, Page 7-8

june, 1957
vol. 31, no. 6

modern castings

in this issue

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On The Management Side

■ **Conveying Foundry Profits.** It has been said that the total tonnage of minerals carried daily on mechanized conveyors could not be moved a distance of one half mile by ten million men with wheelbarrows in a day. Project this futility into your own foundry and try to picture the wheelbarrow performing all the material and product movements now being handled by mechanical conveyors and conveyances. Impossible, yes, because your foundry operation now depends on these devices; cannot move without them. The flow of materials, in fact the whole foundry operation, has been integrated by mechanical conveyors.

With 85 per cent of indirect labor costs attributed to handling of materials within the plant, management, in its constant struggle to reduce costs, should take a close look at this problem. Handling costs are no respecter of size—they confront the small foundry as well as the large one. MODERN CASTINGS believes that this problem is vital to the foundry industry. Consequently a series of articles are now being published with the common theme—Moving Foundry Materials. Already, in the April issue, we have brought you a story devoted to the fork lift truck and now in this June issue an article on pneumatic handling of molding materials appears.

Observe a man working on a mechanized molding line and you will quickly see how his individual productivity has been multiplied many times. The operation that the machine is performing is only part of the story. Notice that sand has been mechanically conveyed to a point over his head where it is convenient to let it fall by gravity into a flask; that the empty flask was conveyed at the right time to his side at a comfortable position so that lifting and moving were minimized; that the finished mold moved away at a speed integrated with these preceding operations. The conveyors pace the operation so that uniformly satisfactory productivity results.

An entire plant operation can be integrated by conveyors. In this same June issue of MODERN CASTINGS an article describes the new Dodge Foundry mechanized cleaning line. The interdependence of all the departments in this foundry are blended together with conveyors.

Safety is a subtle economy of mechanical conveying. The less the man-handling the less the opportunity for man-injury. According to the National Safety Council, mishandling of materials is public enemy number one in industry. You never see a crane with smashed fingers, a fork truck with a hernia, or a conveyor with a sprained back.

Floor space is always at a premium in foundries. So take advantage of your air-rights above this congestion and confusion. Overhead conveyors utilize space you own and too often waste. Castings are cooled on overhead conveyors, dissipating their discomforting heat near the exhaust fans in the roof. Pneumatic conveyor pipe lines snake their way through uncontested airways within the building.

dietrich's corner

by h. f. dietrich

Have we had *too much* prosperity for our own good?

For asking this question, people who are inclined toward self-control will call me ultra-conservative. People less kindly will suggest that I have blown my top, and those who resort to profanity will find another name for me.

However, if we observe the changing attitude of people from the time when living within one's income was considered reasonable, to the attitude of people today, we will find a development that is startling if not alarming.

No one—including myself—wants to see the return of bread lines. We can get along without the slogan, "Brother, can you spare a dime." But, those of us who lived through those times saw some remarkable demonstrations of humanitarianism.

In the early 1930's, I went to work in a small foundry in northern Wisconsin. I had been earning a precarious living by odd jobs and selling specialties from town to town. So physically, I was not prepared for the roll-over machine on which I went to work. By the end of the first day, muscles that I didn't know existed were crying in protest. The first two hand ladles of iron I poured seemed to pull my right arm out of its socket. Without a word from anyone, and above my protests, molders from four floors around me came over and poured off for me.

At that time, tools were never taken off the benches and I would have felt safe to leave my purse on the tool rack over night. If a man became ill on the job, someone would go to his floor to help him clamp or pour off. It was like fighting as a unit for survival.

After about four years of constant expansion and good working hours, the attitude in this foundry changed. With constant influx of new employees, and the dimming memory of bread lines, the slogan became, "Every man for himself." If a man was caught with fifty ladles of iron, the foreman had to assign and pay someone to help pour—and this under protest. A set of store teeth wouldn't be safe on your bench while you went for a drink.

One might attribute the dishonesty

to the new help, but this wasn't true. Men who had been perfectly trustworthy when only a few men were employed, were guilty of grabbing anything that wasn't nailed down. The extremely thin plate of golden humanitarianism put on by adversity began to wear, allowing the base metal to show through.

The experience of a general hustle-for-the-buck attitude wasn't confined to this foundry. In southern Michigan in 1942 a small foundry found orders increasingly harder to get. It was apparent that, somehow, manhours had to be reduced to prolong the work schedule. Logically and economically, the foundry should have gone off a six-day week to keep as many men at work as possible. The time-and-one-half pay, added to the cost of castings, put the company in an unfavorable bidding position for new work.

However, when a vote was taken among the organized employees, the law of the jungle prevailed. The majority voted that 20 per cent of their fellow workers should be cast adrift to face unemployment in a shrinking labor market in order that the greedy majority could continue drawing time-and-one-half for the extra day per week.

In the chaotic reorganization that followed, the bumping system moved molders into the core room and core makers into shakeout jobs. Any little tricks of production, learned from experience, were carefully guarded and had to be learned by new men on new jobs.

Although we all enjoy the high standard of living brought by prosperity, I wonder whether it is worth the price we pay in egocentricity, selfishness, greed, and ethical degeneration. Perhaps we have *too much* prosperity.

St. John Advises Green Sand Shops to Mechanize

Under average conditions brass foundrymen can afford to invest $15,000-$20,000 in mechanization for each man whose labor is saved, H. M. St. John, foundry consultant, said at the American Foundrymen's Society Southeastern Regional Foundry Conference held in Birmingham.

He told foundrymen not to hesitate to mechanize in fear that green sand molding would become obsolete. Since moderate-sized foundries can not afford two widely differing molding methods, he recommended mechanization of existing facilities.

products and processes

Front end loaders used in New York foundry. Two units supply four stations with molding sand, handle reclaim sand, and carry castings to the

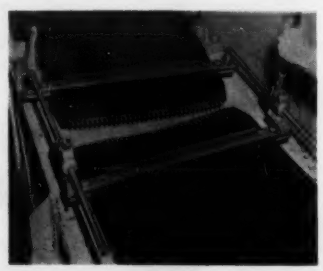
grinding room. Castings vary in weight from 1 to 150 lb. Machines make hauls of 20-300 ft. Handle 75 tons of sand and 30 tons of castings in an 8-hr shift. *Frank G. Hough Co.*

Circle No. 1, Page 7-8

Mold coatings, spirit based, are applied by spraying, painting or swabbing, giving protection against molten metal and yielding a superior finish. Used for green sand, dry sand, and oil sand cores and molds. Grades are classified as to metal or alloy cast. *Foundry Services, Inc.*

Circle No. 2, Page 7-8

Conveyor belt installing device is said to reduce time by using fast-



acting jacks. Clamping tool operated by one man with a wrench. *Flexible Steel Lacing Co.*

Circle No. 3, Page 7-8

Fork lift truck with hydraulic features, operates on gasoline or LP gas. Has speed of 11 mph. Mast tilts 10° back and 6° forward. Truck turns

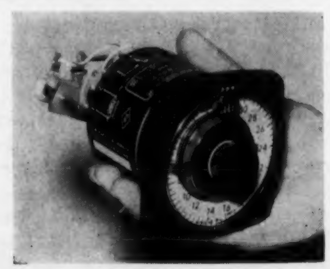
in its own length, 84 in. Hydraulic couplings are reuseable; may be changed in the field. *Pettibone Mulliken Corp.*

Circle No. 4, Page 7-8

Millivoltmeter pyrometers for temperature control also useful for measuring process variables such as speed, vacuum, density, and electrical quantities employs high-strength magnet, printed circuits, miniature tubes, and relays. Electrical connections can be made from all sides of these small instruments. *General Electric Co.*

Circle No. 5, Page 7-8

Reset dial timer, DC, automatic, provides emergency startup for genera-

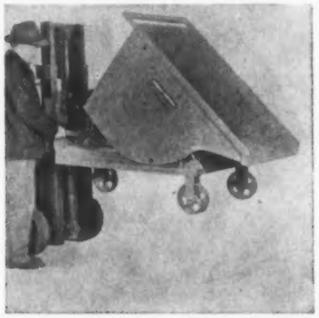


tors, motors, and battery operated equipment. Handles 6-250 volts. *Automatic Temperature Control Co.*

Circle No. 6, Page 7-8

Core and mold coating has fusion point over 4000 F. White color permits visual checking of coating thickness. *Frederic B. Stevens, Inc.*
Circle No. 7, Page 7-8

Self-dumping hopper, 30 in. wide has capacity of 10 cu ft. Mounted on casters, unit may be pushed manually or with fork truck. Rear wheel caster permits sharp turns. Rolls forward to dump. Automatically locks in upright position. Malleable iron and rubber tire casters available. *Roura Iron Works, Inc.*

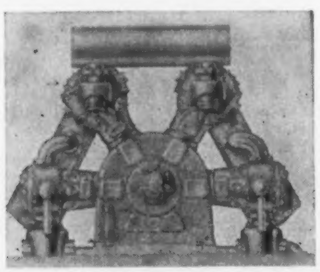


Circle No. 8, Page 7-8

Concrete storage bins for sand and other flowable bulk materials feature interlocking staves having 5000 psi compressive strength. Hoops are used to obtain 5:1 safety factor. Reinforced concrete roof may be added. *Neff & Fry Co.*
Circle No. 9, Page 7-8

Sand conditioner travels from 5 to 50 fpm; has capacity of more than 1 ton of treated sand per min. Unit is self-propelled with two travel and conditioning speeds, forward or reverse. *Moulders' Friend.*
Circle No. 10, Page 7-8

Air compressor, 350-1000 hp, is 4-cylinder, double-acting, water-cooled machine of semi-radial design for heavy-duty work. Output is rated from 2418 to 6048 cfm at 8-125 psi. Six models available. *Joy Mfg. Co.*



Circle No. 11, Page 7-8

Hammer has all-metal body and plastic face. Said to eliminate bounce and shock. Replaceable tip mallets

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resist mushrooming and chipping. Available in two sizes: 2-lb., 1½-in. tip and 2¼-lb., 1¾-in. face. *Custanite Corp.*

Circle No. 12, Page 7-8

Barrel truck handles loads to 1000 lb. To load, truck is shoved against barrel and steel catch dropped over

the rim, pulling truck loads the barrels. Width of 22 in. allows work in aisles. *Palmer-Shile Co.*

Circle No. 13, Page 7-8

Core binder, self-curing, is used with a non-toxic, non-staining accelerator which serves as control agent for curing process. Must be used with dry sand. Normal core baking temperature is 425 F; reduces baking time 20-50%. Shakeout and labor time also said to be reduced. *Reichhold Chemicals, Inc.*

Circle No. 14, Page 7-8

Emergency lighting unit operates automatically during normal power failures. Recharges following use. Three lamps may be powered by unit. Designed for wall or post installation,

it may be used for additional lighting by plugging into 115 volt, 60 cycle outlet. *Exide Industrial Div., Electric Storage Battery Co.*

Circle No. 15, Page 7-8

Epoxy remover hand cream is used after working with resins, adhesives or paint and rinsed off with water. Eliminates use of solvents according

to manufacturer. Said to contain no caustics or scouring abrasives. *Plaster Supply House.*

Circle No. 16, Page 7-8

Indicating pyrometer uses mirror scales to reduce parallax. Ranges vary from -400 to 3000 F. Full scale accu-

racy is 2 per cent. Available in panel mounting, portable and bench models. *Assembly Products, Inc.*

Circle No. 17, Page 7-8

CO_2 binder is claimed to give cores maximum collapsibility, compression strength, scratch hardness, shelf life and show a minimum of grain shedding. Sand treated with binder said to pack or blow with maximum density. Other advantages listed are quick reaction without tendency to be viscous or gummy. *Frederic B. Stevens, Inc.*

Circle No. 18, Page 7-8

Shell molding machine, automatic, has pattern size of 20x30 in. with adapters available for fitting smaller patterns. Equipment is available in

two standard sizes with manual, mechanized of fully automatic operation. *Shell Equipment Co.*

Circle No. 19, Page 7-8

Speed reducers, shaft mounted, change speed from 60 to 350 rpm with use of fixed or adjustable-speed wedgebelt drives and handles loads to 25 hp. Available in four shaft sizes, 2 to 2-15/16 in. diameters. Units

have adjustable-torque arms. *American Pulley Co.*

Circle No. 20, Page 7-8

Stair tread, aluminum, has high corrosion resistance and abrasive nose

to reduce slipping. Holds 3000 lb. Grating cast in one piece. Sizes from 24 to 42 in. lengths, 10 in. widths. *Aluminum Co. of America.*

Circle No. 21, Page 7-8

Riser compound is said to keep gray iron and steel molten longer in risers, make possible smaller riser necks. *M. A. Bell Co.*

Circle No. 22, Page 7-8

Epoxy resin for making core boxes, patterns and repairing castings contains 80 per cent aluminum, 20 per cent plastic. May be sandblasted after setting. Adheres well to all metals. Has tensile strength of 10,000 psi, compressive strength of 15,000 psi. *Devcon Corp.*

Circle No. 23, Page 7-8

Hardness testers feature motorization of the load, reducing fatigue and increasing production. Available in 8 and 12 in. vertical capacity. Greater

accuracy claimed for mechanical load application. *Torsion Balance Co.*

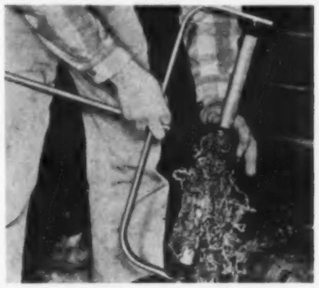
Circle No. 24, Page 7-8

Powered turntable, 48 in. diameter, used with conveyors to transfer loads at 90 or 180°. Guards and side rails

are adjustable. Occupies 5x5 ft. space. *Samuel Olson Mfg. Co.*

Circle No. 25, Page 7-8

Magnetic broom picks up scrap, chips, nuts and bolts. Uses permanent rotating-cylinder magnet eliminating



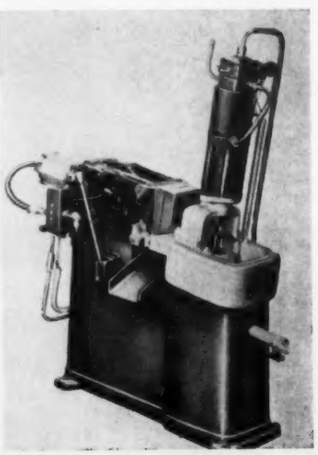
batteries and wiring. Offset handle permits use without stooping or bending. Comes in five widths. *Magnetool Div., Multifinish Mfg. Co.*

Circle No. 26, Page 7-8

Temperature probes using thermistors as sensing elements are designed for measuring surface temperatures of gas, liquid, or highly corrosive fluids up to 500 F in confined areas. Sensing element is insulated from ground and sealed against water except for screw terminals. *Rosemont Engineering Co.*

Circle No. 27, Page 7-8

Die casting machine has shot capacity of 1 lb. and produces up to 3000 shots per hr. Utilizes exclusive DCMT prefabricated die blocks elim-



inating much of the die costs. Construction said to reduce maintenance and down time. *British Industries Corp.*

Circle No. 28, Page 7-8

Sand conditioner for floor-type operations is self-propelled and self-load-

ing. Three models and sizes have capacities from 35-60 tons of sand hourly. Machine prepares 25-40 squeezer floors in 8 hr. *States Engineering Corp.*

Circle No. 29, Page 7-8

Temperature checking system measures melting points of metals and alloys not accurately known. System uses light-weight immersion thermocouple and portable electronic indicator or permanently mounted recorder. Assists in cutting waste due to faulty castings, saves fuel burned in overheating melts, and aids in quality control. Used to determine exact "freezing" point of new melts, indicates when melt reaches pouring temperature and checks temperatures at various shop locations. Readings are made on indicator or chart recorder. *Leeds & Northrup Co.*

Circle No. 30, Page 7-8

Stainless steel alloy, developed at Ohio State University, is said to have better mechanical properties than 18-8 stainless steels. Composed of 25-27% Cr, 4.75-6.00% Ni, 0.04% C, 1.75-2.25% Mo, 2.75-3.25% Cu and 1% each of Si and Mn. *Alloy Casting Institute.*

Circle No. 31, Page 7-8

Holding crucible made of silicon carbide, features double compartments. Currently used by Midwest foundry with stationary melting furnaces. Metal is maintained at constant temperature in crucible following melting. *Electro Refractories & Abrasives Corp.*

Circle No. 32, Page 7-8

Epoxy resin finish-stripper prepares rejected parts for refinishing and removing paint from work holders. Does not remove or damage the bonderizing or phosphate coating. Resins pops off after 20 sec dwell time; then flushed away with water. *Beck Equipment Co.*

Circle No. 33, Page 7-8

Core and mold wash is a wetting agent which lowers the surface tension of water. Allows water to penetrate below the surface, carrying refractory particles of wash with it. Said to prevent burn-in of sand, eliminate metal penetration and give a smooth finish. *Aquadyne Corp.*

Circle No. 34, Page 7-8

Temperature controller, mercury-actuated, air-operated, offers throttling control for continuous flow processes where fluctuation must be minimized. Two types: on-off fixed high sensitivity or proportional band. May be

Circle No. 130, Page 7-8

changed from direct to reverse acting or vice-versa without tools. Temperature range of 800 F. *H. O. Trerice Co.*

Circle No. 35, Page 7-8

Sand rammer features double-action seal against sand and dirt. Tool is cooled through a built-in cooling system; exhaust air, cooled by expansion, goes through barrel to exhaust chamber cooling barrel at hand-hold position. Available in three sizes. *Ingersoll-Rand Co.*

Circle No. 36, Page 7-8

Water purifier for industrial and laboratory work demineralizes by ion-exchange method. Resin used in process may be regenerated; color changes indicate when material must be changed. Flow rates from 40 to 480 gals. per hr. *Enley Products, Inc.*

Circle No. 37, Page 7-8

Liquid dispensing pump utilizes a foot-operated air pump to start syphon action. By elevating carboy above the receiving containers a number can be filled by operating a petcock. *General Scientific Equipment Co.*

Circle No. 38, Page 7-8

Grating and treads feature abrasive fired onto surface for non-skid properties. Available in three bar spacings. Resists common acid and alkali reagents, oil, gasoline, and salt water as well as sand and other abrasives found in foundries. Also prevents polish given by sand to metal surfaces. *Reliance Steel Products Co.*

Circle No. 39, Page 7-8

Stress-rupture and creep testing machine, air-operated, available in 12,000 and 15,000 lb. capacities. Amount of speciman elongation under prevailing load is plotted automatically on electric recorder. Separate controls allow selection of temperatures to 2000 F. *Tinius Olsen Testing Machine Co.*

Circle No. 40, Page 7-8

CO_2 injection kit for cores and molds consists of a two-stage regulator, 15 ft. hose, hand-operated valve, couplings, two sizes of interchangeable rubber plunger cups, steel injection tube, and fittings. Suitable for hardening rammed or blown cores. *National Cylinder Gas Co.*

Circle No. 41, Page 7-8

Fork lift truck furnace charger has 4000 lb. capacity. Tilting action of

Circle No. 130, Page 7-8

10° provides motion for pickup and unload. Operated by battery or gas-electric power. *Mercury Mfg. Co.*

Circle No. 42, Page 7-8

Surface pyrometer weighs 1½-lb., checks surface temperatures with accuracy of 2 per cent over entire

scale. Thermocouple, 12 in. long, is insulated with refractory beads. Available in three ranges: 50-650 F, 0-1600 F, and 0-2300 F. *Pacific Transducer Co.*

Circle No. 43, Page 7-8

Micro-height gage for layout or inspection is graduated in hundredths of inch; vernier-type readings in thousandths. Device has 4-in. vertical range; additional inch gained by reversing scriber in its support. *Greist Mfg. Co.*

Circle No. 44, Page 7-8

Sample weighing device permits micro-weighing operations without vi-

bration, temperature, air currents or leveling. Instrument is self-contained; needs no external power or utilities. *Central Scientific Co.*

Circle No. 45, Page 7-8

Release agent for plaster or plastic facilitates release from core boxes. Serves as coating on mold and said to reduce moisture on wet plaster
Continued on page 92

Circle No. 193, Page 7-8

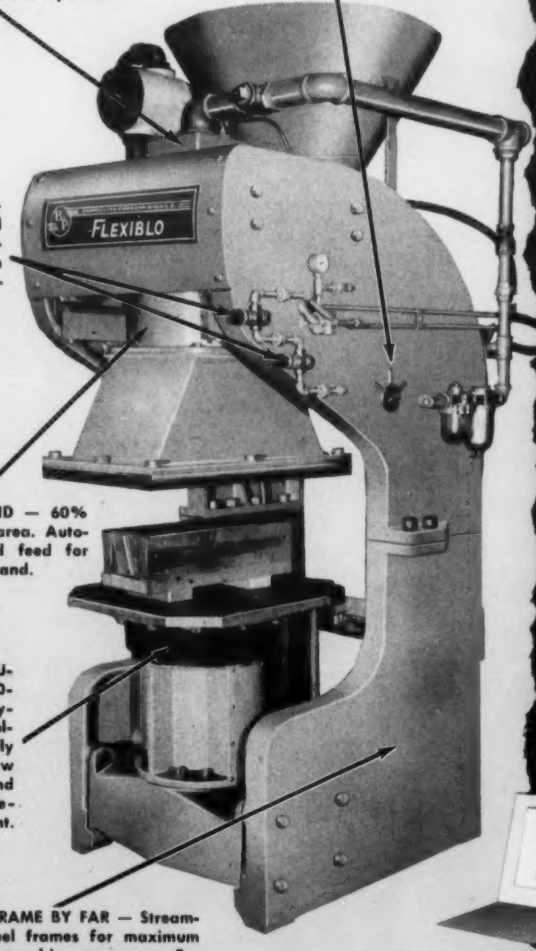
we call it the

NEW FLEXIBLO

it's a blower, a pulsator,
a prefiller, a core shooter
and much more
...all in one ***simple*** *machine!*

3 TYPES OF OPERATION — 3-position dial provides choice of high pressure blow, regulated pressure prefill with high pressure blow, or regulated pressure pulsator.

UNEQUALED BLOW VALVE DESIGN — Advanced design blow valves, patented, fast-acting with fast exhaust for revolutionary three-machine-in-one operation.



ALL-AIR CONTROL — All-pneumatic control circuit — push button-sequenced operation — no troublesome relays or controls.

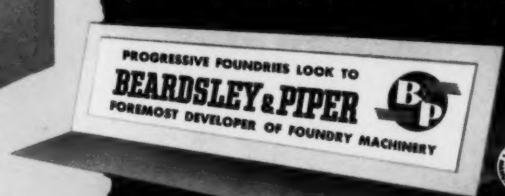
HANDLES ANY SAND — 60% greater sand feed area. Automatic vibrator sand feed for handling any core sand.

PRECISE HYDRAULIC DRAW — 10-inch draw — hydraulically-controlled — with fully adjustable draw stroke speed and hydraulic table-height adjustment.

STRONGEST FRAME BY FAR — Streamlined cast steel frames for maximum rigidity and machine accuracy. Far stronger and more durable than any machine in the field.

guaranteed to blow any core that can be blown by any blower or so-called shooter using the same box, either metal or wood, and the same sand - and to blow it faster and harder and with less core box wear on cavity and face or joint!

Write now for full information —
Beardsley & Piper Div.
Pettibone Mulliken Corporation,
2424 N. Cicero Ave., Chicago 39, Ill.



MEMBER FEMA

the editor's field report

by Jack Schaum

Photographic Memory? Most of us wish we had one. But since most of us don't have a photographic memory, an excellent substitute has been invented—the camera. More and more foundrymen are making use of the camera as a photographic memory device that never forgets, always tells the truth, and creates a permanent record for posterity.

At the AFS California Regional, Dominic Coccione, Washington Iron Works, told how their foundry photographed every important step in making molds and cores, setting cores, placing weights, and finally the position of men and ladles during pouring. A year later when this same casting is re-ordered there is no argument as to what size flask was used, how large were the core prints, how many ladles were used, and how many men were needed to pour-off. Man's fallible memory has been fortified with man's infallible memory device—the camera.

Carl Schopp, Link Belt Co., tells about their practice of photographing every week the progress being made in all phases of construction at their new plant in Indianapolis. These permanent photo-records serve as guides to future foundry building plus many other uses.

They say the hand is quicker than the eye—but not the eye of the motion picture camera. Remembering motion is the forte of this device. Proponents of its use have already foreshortened this function by coining the term "memomotion."

At the AFS Castings Congress in May, L. L. Randolph, American Steel Foundries, presented a paper "Memomotion to Set Standards." The author describes how movie cameras are run at the slow speed of one frame per second as well as at conventional speed in order to record the actions of one or more men in the molding department. Marked improvements in production have resulted from time-studies made in this fashion.

The interest in this subject is obviously nation-wide. In another section of the country, Birmingham, the AFS Southeastern Regional Conference had on its program J. A. Westover, Westover Engineers, Inc. Mr. Westover showed a series of films taken with the conventional 8 mm family-hobby type camera. Six different core makers were "shot" while each rammed the same core box. By studying the individual techniques, the most efficient movements were selected and blended into a smooth flowing series of steps. As a result the productivity of the individual coremakers was doubled.

Improve your foundry practices and efficiencies with an inexpensive piece of equipment—a camera.

P.S.—Let the Editor know of any other uses you may have found for the camera in the foundry.

Coated Sands for Shell Molding: Two different speakers at the AFS East Coast Regional Conference emphasized the trend toward the use of coated sands for shell molds and cores. Because of the segregation problem in shell core blowing, sands coated by the cold, warm, or hot processes are almost in universal use. One prediction is that within ten years all sand used in the shell process will be coated. Coated sands, compared with the dry resin-sand mix, eliminate much of the dust and segregation problems and use only half as much resin resulting in a 50 per cent cut in resin costs and gas evolution.

Competition for Epoxy Core Boxes? Just about the time you think epoxy resin patterns and core boxes are the last word another new material creeps into the picture. Core boxes lined with a synthetic rubber, are demonstrating unusual resistance to the severe abrasion that accompanies core blowing. The resilience of the rubber seems to make it immune to wear. The rubber surface does not tear or scratch and can be hammered without chipping, cracking, or breaking.

This rubber is like thiokol rubber which is in liquid form that hardens within several hours after certain chemicals are added. The techniques for making patterns and core boxes are remarkably similar to those used in the epoxy resin process. After mixing the ingredients, the rubber may be poured or painted on a master pattern to a thickness of less than ¼-inch. It must be keyed into a strong backup such as a metal contour plate. One of the bonus properties of core boxes line in this manner is the fact that CO_2 cores do not stick.

Medical Records Play Key Role in Combating Noise

Medical supervision of workers exposed to noise is essential for the benefit of employee and employer. Conservation of hearing can be achieved through medical examination, proper job placement, and protection against noise.

Before assigning employees to noisy work environments, their exposure to noise in previous jobs and in military service should be determined. The medical records should include history of earache, ear discharge, ear injury, surgery (ear or mastoid), head injury with unconsciousness, ringing in the ears, hearing loss in the immediate family, drugs used, and allergy and toxic exposures.

Audiograms Necessary

Objective examination should be supplemented by subjective tests of hearing acuity. Pure tone audiometry is the best method of testing hearing ability. The audiometer is powered by an electric current and enables production of tones in various frequencies which are audible to the human ear. Tests should be given only by trained personnel.

The best hearing measurement is obtained if tests are made before noise exposure, such as at the start of a shift or after a week away from work.

Periodic examinations of workers are equally important after placement in a noisy environment. Re-examinations, ideally, should be made about 30 days after placement to test for possible early effects of noise, and at semi-annual or yearly intervals thereafter, depending on the noise levels to which the worker is exposed.

Physicians Determine Fitness

It is the physician's responsibility to interpret and evaluate the various medical data relating to each individual. He should also determine suitability for employment in a noisy atmosphere. Proper job placement of workers, matching their physical capacities to the physical demands and exposures of jobs, is an established function of the industrial physician.

The ideal method of preventing noise damage to the ear is by control or reduction of the noise by engineering methods. When these controls are not feasible it may be necessary to resort to protection of workers through the use of suitable ear plugs, earmuffs or helmets.

This article is based on material contained in the American Foundrymen's Society FOUNDRY NOISE MANUAL, soon to be released.

let's get personal

A. L. Boegehold . . has retired from General Motors Corp. after 36 years of service on its research staff. Mr. Boegehold has been assistant to the vice-president in charge of research staff and will continue to act as a consultant on metallurgical problems. For his many achievements, which include the development of pearlitic malleable iron, he was awarded the J. H. Whiting prize by AFS in 1929 and received the Society's J. H. Whiting Gold Medal in 1942.

S. L. Gertsman . . has been named chief of the Physical Metallurgy Division of the Mines Branch of the Canadian Department of Mines and Technical Surveys. He represents his government on 19 national and international committees concerned with the metal and foundry industries, including two AFS technical committees.

F. E. Noggle . . has been elected a vice-president of Westover Corp., Milwaukee. He has been associated with the consulting division of the company for ten years.

Allen M. Slichter . . newly elected national director of AFS and his three brothers, Donald C., Louis B., and Sumner H., were cited for outstanding accomplishment at the annual Wisconsin Engineers Day celebration at the University of Wisconsin. Their father was Dean of the university's graduate school until his retirement.

W. A. Merriman . . has been named manager of castings sales for Erie Forge & Steel Corp., Erie, Pa. He was formerly sales engineer for Pittsburgh Steel Foundry, Glassport, Pa.

G. E. Tisdale . . has been elected secretary and a director of Lawran Foundry Co., Milwaukee. He will continue to represent the General Grinding Wheel Co. in the Milwaukee area. Mr. Tisdale is a past chairman of the AFS Wisconsin Chapter and is a former director of G.I.F.S.

L. S. Denne . . has been named national sales manager for Jo-El Co., manufacturer of aluminum bottom boards and core plates.

N. T. Booth, Jr. . . president of Deemer Steel Casting Co., New Castle, Dela., has been elected to the Young Presidents' Organization, Inc. This is a national association of executives who attained presidency of an industrial company before becoming 40 years old.

H. K. Intemann . . has been appointed president of Electro Metallurgical Co., Div. of Union Carbide Corp. Mr. Intemann joined Union Carbide in 1930 as a laboratory technician. The division also has a newly elected vice-president, **A. L. Foscue.**

F. C. Hammer . . has been appointed public relations director for Central Foundry Div., General Motors Corp.

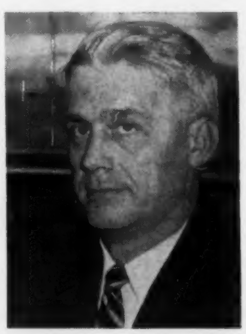
R. V. Grogan . . has been appointed West Coast representative of the Foundry Products Div., Archer-Daniels-Midland Co. His headquarters will be 6608 East 26th St., Los Angeles.

W. T. Shute . . has joined West Michigan Steel Foundry Co., Muskegon, Mich., as production manager. He was formerly plant manager at Canadian Steel Foundries (1956) Ltd., Montreal, and is a past chairman of the AFS Eastern Canada Chapter.

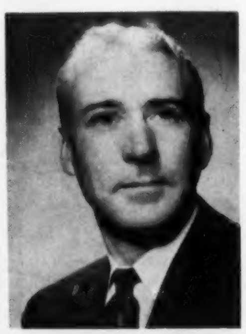
E. H. Sherwood . . has been elected vice-president, International Div., National Malleable and Steel Castings Co. He has been assistant vice-president of the division since 1956.

P. B. Higgins . . British foundry executive has been elected president of the Association of Bronze and Brass Founders. Mr. Higgins is managing

S. L. Gerstman



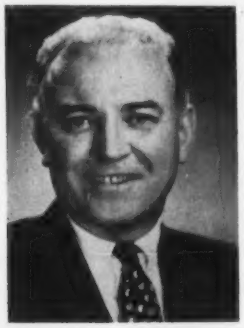
W. A. Merriman



N. T. Booth, Jr.

director of Yorkshire Engineering Supplies Ltd. He is also deputy chairman of Jonas Woodhead & Sons Ltd., and is a director of George Beardsley & Co. Ltd., Specialloid Ltd., and Aero Piston Ring Co. Ltd.

Mexico Refractories Co., Mexico, Mo., has elected **W. B. Leach** president and has named the company's founder, **J. B. Arthur**, chairman of the board.



A. N. McFarlane

A. N. McFarlane . . has been elected president of Corn Products Sales Co., marketing agency for Corn Products Refining Co.

American Brake Shoe Co. has elected **T. W. Russell, Jr.**, vice-president. He has been succeeded as general purchasing agent by **F. B. Newbert.**

H. R. Merrill . . has been named vice-president of Behr-Manning Co., a division of Norton Co.

L. W. Kohlmeyer

L. W. Kohlmeyer . . has been named manager of the Wheelabrator Corp. New York office.

W. H. Stewart . . has been appointed staff engineer for the Industrial Furnace Div., Sunbeam Corp., Chicago. He has been engaged in furnace design, refractory research, and

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related metallurgical problems for 17 years.

American Smelting and Refining Co. has named a new top management group. **K C.. Brownell** moved from president to chairman, **R. W. Vaughan** was named president and **O. S. Straus** was elected chairman of the finance committee.

W. R. Neely . . has been made manager of sales development for Hansell-Elcock Co., Chicago.

K. H. Pierce

K. H. Pierce . . has been appointed sales manager for Precision Castparts Corp., Portland, Ore., investment caster. He was formerly production manager.

Alloy Precision Castings Co., Cleveland, has elected **E. R. Broden,** president of SKF Industries, Inc., and **R. M. Mock,** president of Lear, Inc., to its board of directors.

F. S. Claghorn

F. S. Claghorn . . sales manager of Fletcher Works, Inc. Centrifugal Div. has been promoted to sales manager of the firm's Foundry Div.

National Lead Co. has announced two new appointments. **G. B. Coale,** general manager of Baroid Div., has been named a vice-president. **Rear**

Circle No. 133, Page 7-8

Admiral M. P. Hottel, retired, has been named manager of the Washington, D. C., office.

L. H. Bates . . has been named executive director, Training Service, Bureau of Apprenticeship and Training, U. S. Department of Labor.

J. H. Baisley . . has been named metals industry sales manager for the Pittsburgh office of Allis-Chalmers Mfg. Co.

Robert J. Miller . . has joined Fred W. Fuller Co. Cleveland headquartered manufacturers representatives. For the last five years he has been employed at the Ford Motor Co., Cleveland Foundry.

H. J. Harden . . has been named an abrasive engineer with the Peninsular Grinding Wheel Co.

C. C. Parker . . has been appointed grinding wheels sales manager for the mechanical goods division of United States Rubber Co.

N. R. Ekholm has been named manager of the Norton Co. Atlanta, Ga., office and **J. R. H. Truelsen** will become manager of the firm's Indianapolis office.

O. H. McCleary has been elected president of Mathews Conveyor Co., Ellwood City, Pa. **L. T. Sylvester,** president of the company since 1952, was elected chairman of the board.

L. T. Moate . . American Steel Foundries controller, has been named a director of General Steel Castings Corp., Granite City, Ill.

Sorry—but we're doing highly confidential defense work in this part of the plant.

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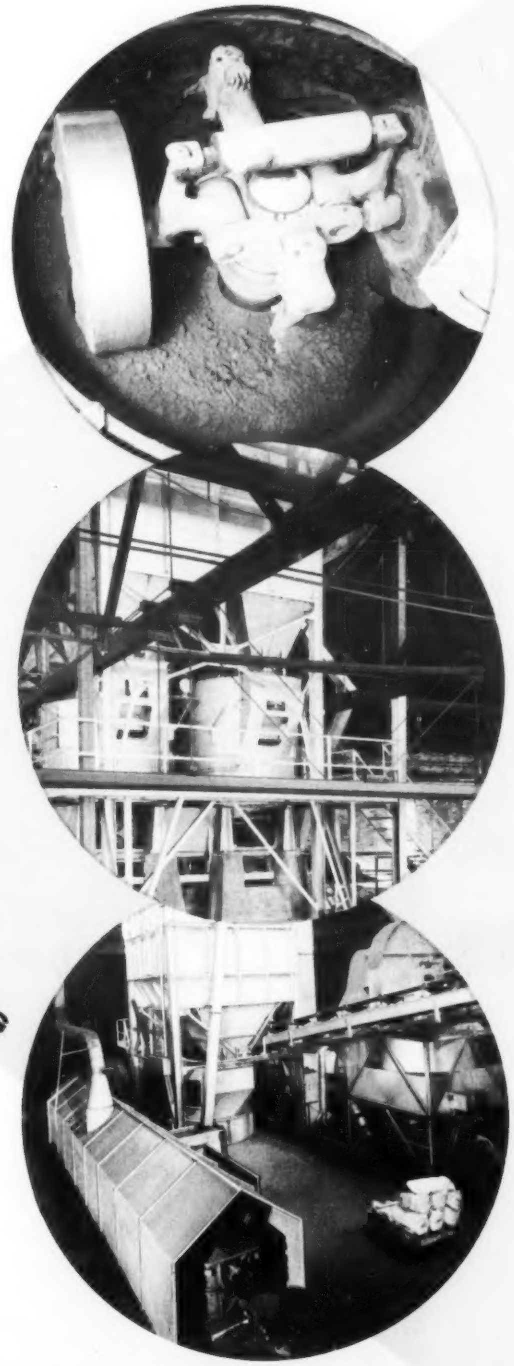


THE FOUNDRY INDUSTRY IS OUR BUSINESS

For half a century National Engineering Company has devoted its activities to the planning, development and manufacture of foundry equipment designed to help you make better, more salable castings.

Modern day sand practices saw their beginning with the advent of *mulling* foundry sand—made possible by the introduction of the Simpson Mix-Muller. Since then, the Mix-Muller has played an important part in today's widespread use of synthetic sands and the continuing development of resin bonded sands.

National sand and mold handling equipment has made similar contributions towards the improvement of casting quality, lowered handling costs and better environmental conditions in the foundry.

The production and sale of castings has become as important a part of our business as it is of *your* business. And this is the reason why National Equipment, whether it be a Simpson Mix-Muller or a complete sand handling system, is conceived, built and regarded by National—as a *machine* to produce castings.

[redacted]

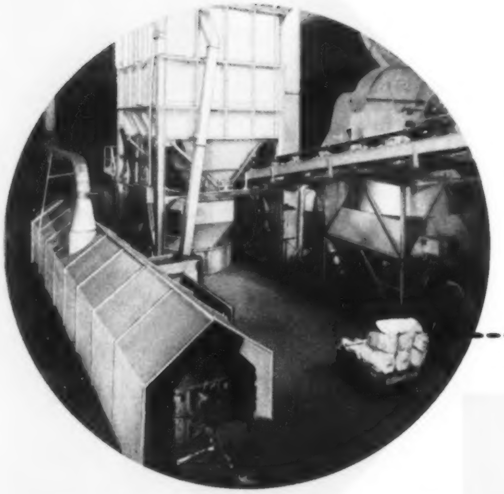
NATIONAL

ENGINEERS

FOR FOUNDRIES

Practical foundry experience . . . which permits competent appraisal of the problem at hand is the foundation upon which every National engineered job is built. It is a complete service because experience has proven that the similarity of one foundry to another ends at the front door.

Here is a broad outline of how National coordinated planning, engineering and manufacturing services are utilized by the industry:



COORDINATED PLANNING SERVICE

This professional planning service draws on our extensive background in equipment design and manufacturing to offer competent and authoritative consultation on various phases of foundry planning and engineering. Staffed to handle design, layout, equipment and construction of *entire* foundry operation.

SAND HANDLING

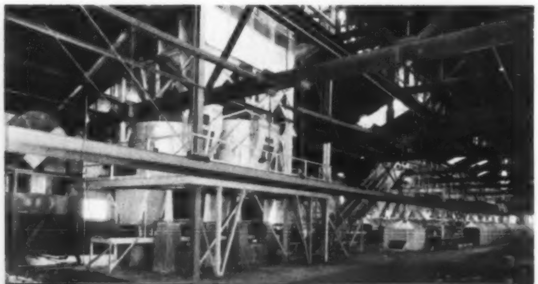
The National service begins with a thorough analysis of your requirements, which can often be met by simple, well-integrated equipment items. This service offers the user the benefit of many exclusive, National-patented features — designed to provide long life and low maintenance for National Sand Systems.

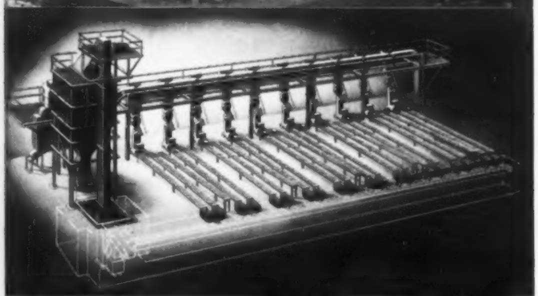
MOLD HANDLING

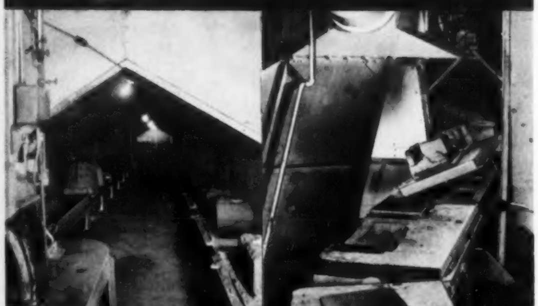
National builds a variety of car, pallet and track type conveyors for integration into mold handling systems of National design. Shown at right are some of the features included.

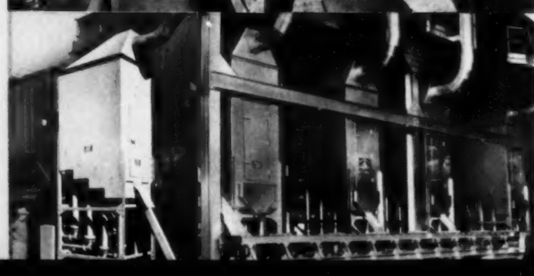
SAND RECLAIMING SYSTEM

The National Sand Reclaimer has been quickly accepted by users throughout the country as the first means for the average foundry to *profitably* reclaim sand. A recent study of savings realized by six average users showed these units were turning in total savings of $30,000 *per month*. Many other users are experiencing savings similar to these. Equipment is often amortized in less than a year. Contact your National agent for details.









NATIONAL

BUILDS THE SIMPSON *MIX-MULLER*

Thousands of foundrymen endorse, by ownership, the *true mulling principle* of the Simpson Mix-Muller. These basic features appeal to foundrymen because they provide more mulling per dollar invested, per ton of sand prepared:

SIMPLICITY of design provides low maintenance and longer life.

WIDE FACE MULLERS mull *more* sand with every revolution.

SPRING LOADED mullers provide needed versatility . . . the *right* pressure for the right sand.

INTENSIVE smearing kneading action coats *every* grain.

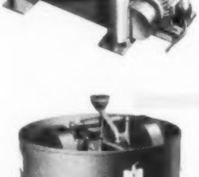
3F MIX-MULLER

The 3F Mix-Muller will produce more sand per hour, per batch and in *fewer* batches per hour than any muller available for foundry use. Maintenance of two 3F Mix-Mullers cost Elyria Foundry Division *one cent* per ton of sand prepared, in 3½ years of 16 hr. a day usage.

2F MIX-MULLER

In 1950 a 2F Mix-Muller *eliminated* 20 man hours of work per day for Emmaus Foundry Co. The same mixer now turns in 16 hrs. a day on molding sand and a *week's requirement* for dry shell sand on Saturday. Fourteen 2F Mix-Mullers produce *all* core sand for two of the auto industry's largest foundries.

1½F MIX-MULLER



Low operating and maintenance costs insure the utility of this medium size Mix-Muller for use in medium size shops with *growing* sand requirements. Savings in bond and other additives more than pay for your investment in more and *better* sand for molding, facing, core or shell sand requirements.

SIMPSON PORTO-MULLER

Any foundry has a job for the Porto-Muller. With it, you can mix *any* sand, *anywhere* in your shop. It's 100% self contained. You just plug it in — and *start* mulling. It is ideal for shell sand — for preparing facing or for taking the "load" from production mixing equipment. Many shops use the Porto-Muller for *all* their sand requirements.

LF MIX-MULLER

The LF "Lab Mill" *duplicates* production mulling. It's a *professional* tool that can help you develop better, smoother and more salable castings through laboratory control — without sacrificing shop production time for experimentation.

NATIONAL AERATORS

National Aerators are designed for direct attachment to mixer discharge or can be furnished for use anywhere in the sand system. They provide free-flowing, lump-free sand at the molder's station, eliminate most riddling and, by their gentle combing, fluffing action, actually improve the molding quality of the sand!

NATIONAL BUCKET LOADERS

You can cut operator time *in half* with a National Bucket Loader for your Mix-Muller! You eliminate over and undercharge and do away with laborious manual charging of the mixer. You can save up to 50% in sand preparing time.

NATIONAL TIMEMASTER

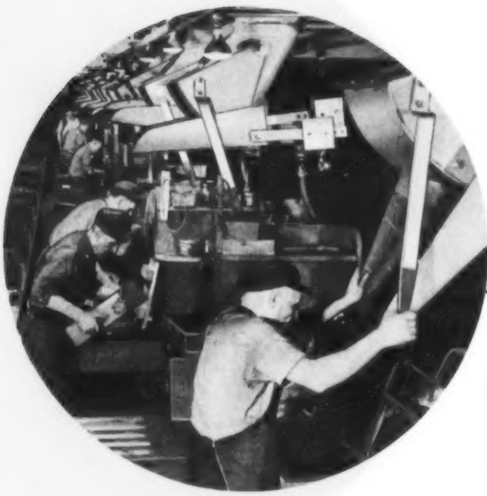
Timemaster saves you man hours! By providing full automatic control over the mixing cycle it can eliminate guesswork — take the "human element" out of batch composition and save you time and money in sand preparation and sand handling.

NATIONAL

BUILDS

SAND HANDLING EQUIPMENT

The "growth" problem of smaller and medium sized foundries can be met on an economical, yet progressively practical basis with standardized "packaged" units such as shown below. The National services encompass all phases of foundry mechanization—from a simple off-the-floor molding arrangement to a complete foundry sand preparing and handling system.



MOLDERS HELPER

Bring overhead sand to the smallest operation at low cost! *Eliminate* shoveling and sand hauling. Molder's Helper is charged either by front end loader or can be attached to *any* production size Simpson Mix-Muller. You get *aeration, elevating* and *storage* of sand for one to four molding stations.

SHELL MULL

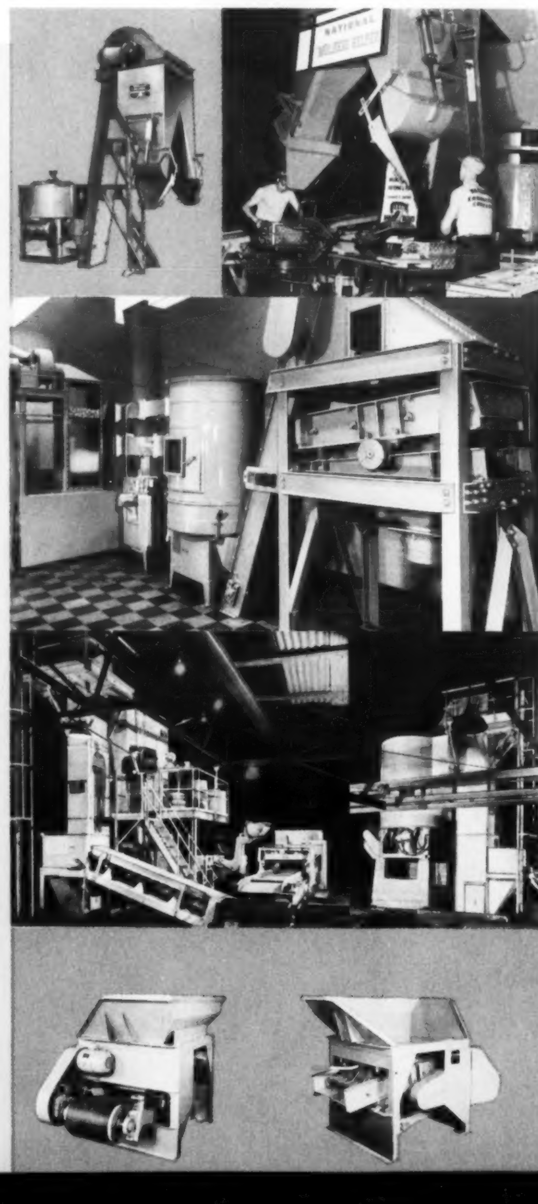
Provides completely coated, high tensile, free flowing, lump-free shell sand. This fully integrated shell sand preparing plant includes: heater, Mix-Muller, dust collector, elevator, aeration and screen. In use in over 30 foundries, including *every* principal auto manufacturer in the U.S.

UTILITY UNIT

An expandable sand preparing unit designed to increase output at welcome savings in time — *without* major mechanization and need for large capital investment. Includes sand castings hopper for front end loader, screening, conveying and magnetic separation equipment; bucket elevator; mixer with dust hood and aerator.

SCREEN MASTER

Compact, easy to use screening unit which requires no pits or foundations. Provides clean, uniform and lump-free sand for rebonding. Easily incorporated into existing installations. Includes hopper, magnetic belt conveyor, motors and starters.



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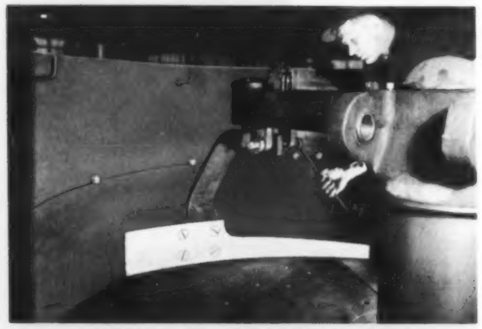
NATIONAL

CALLS ON THE INDUSTRY, DAILY, WITH . . .



REPAIR PARTS

If you operate a Simpson Mix-Muller all records pertaining to that equipment are kept on permanent file in our Repair Department. This is a good point to remember *before* you buy a *used* Simpson — call us for any information pertinent to its history and condition of repair. When ordering spare, or repair parts, please furnish us with both the part number (from your parts list) and serial number of the mixer.

PERFORMANCE LABORATORY

As a service to you, National now offers complete sand testing and laboratory facilities. Use of our SHELL-MULL equipment and laboratory size Mix-Mullers can be made available. Arrangements for documented testing of your sand formulas for mulling or reclamation characteristics, are invited.

SERVICE

Several full time service crews are maintained by National. These men spend all of their working hours in foundries. They *know* National equipment and how to work with foundry maintenance people. Their services are available wherever National equipment is used.

NATIONAL FIELD SERVICE

Your *"Man from National"* is a specialist in the integration of foundry mixing equipment. He draws on a background of National experience that has been directed towards new, better and faster means of producing castings for almost 50 years. His knowledge of and experience with, foundry equipment and practices is one of National Engineering Company's most valuable assets.

NATIONAL ENGINEERING COMPANY

549 Machinery Hall, Chicago 6, Illinois

50M-457-SF

Printed in U.S.A.

Oxygen Torch Removes 200 Ton Risers in One-Man Operation

Risers weighing up to 400,000 lb are being removed in a one-man operation using a new oxygen blowpipe.

Capable of cutting through steel sections 55 in. thick in a single pass. Greater thicknesses can be made with multi-pass operations. Exceptional preheat obtained through separate hose lines for preheat and cutting oxygen, eliminates auxiliary equipment.

The nozzle alignment places the blowpipe nozzle off-center from the middle of the blowpipe allowing the operator to widen the kerf by uniformly rotating the torch. Once the kerf is widened, the torch can be inserted to deepen the cut.

The blowpipe is made by Linde Co. Div., Union Carbide Corp.

Riser weighing 120,000 lb, measuring 48 x 120 in. was removed by single operator.

Trough Carries Cable

Greater flexibility in power cable installations is claimed for a system of supporting electrical cables in an open type of expanded metal trough. Conduit is used only to connect individual machines or where cable would be exposed to damage in the open trough.

Other advantages claimed for the trough are: free air current ratings, compactness of installation, speed of installation, and accessability.

Utilities for several years have used cable trough in preference to conduit. A recent decision by electrical inspectors approving this type of cable supports is expected to advance its use in other industrial installations.

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High-Strength Aluminum Alloy Replaces Forging

A high-strength aluminum casting alloy that offers substantial savings in weight, cost and production time has been developed by metallurgists of North American Aviation's Los Angeles division.

The alloy is being used in castings to replace high-strength forgings in the F-100 Super Sabre. Considerable time, labor and money and material are saved using castings with the elimination of giant presses, expensive dies and costly machine work. On one part alone, $200 is saved with one-third the time required compared to forging.

Grinding risers of aluminum alloy casting which has cut production time and costs.

Alloy 42B is said to be superior to other aluminum alloys in castability in either permanent or sand molds. A part cast in a sand mold has a minimum strength of 42,000 psi and if cast in a permanent mold has a tensile strength over 45,000 psi.

The alloys can be cast in sand or permanent molds using ordinary foundry techniques. This allows designers to work with shorter lead time.

With the development of this alloy, the job of producing intricate, completely-formed parts in a single operation is considerably simplified, according to North American.

Essential Small Business Records Listed in Pamphlet

Fundamental records for small businesses are explained in a pamphlet recently issued by the Small Business Administration. Net worth and profit are explained as well as factors to consider in choosing and installing a record system. Copies are available free from field offices and Washington headquarters of the Small Business Administration, Washington 25, D. C.

pouring off the heat

Dietrich vs Doctors

■ As an antidote for the comments made in Dietrich's Corner, page 82, April, MODERN CASTINGS, I suggest reading an article entitled "Is there a Doctor in the Plant?", appearing in the March 30 issue of the Journal of the American Medical Association.

Almost without exception when writers wish to attack occupational health they go back to remote periods such as 1924 or 1918 for their material. It is high time that some of these writers knock the scales off their eyes and view in perspective what is truly happening in the world of occupational health.

CAREY P. MCCORD, M.D.
Institute of Industrial Health
University of Michigan

■ The comments found in "Dietrich's Corner", April, MODERN CASTINGS, are indicative of industrial medicine practices in 1924. However I do not believe you would find that the "influenza fixation" to "draw house calls" would be tolerated today.

R. T. JOHNSTONE, M.D.
Los Angeles, Calif.

Letters are still coming in from doctors concerned about Mr. Dietrich's comments. Watch for next month's edition!—Editor.

another Bill

■ As a young patternmaker in San Francisco, I wish to say "amen" to the comments made by "Bill" of Berkeley, published in the February issue of MODERN CASTINGS, page 25. I am aware that gear patternmaking is not so much in vogue as in days gone by—so much so that in years one does not see a gear pattern made.

Perhaps you could explain the making of worms and worm wheel patterns, bevel gear patterns, and for good measure the layout of a propeller.

ANOTHER BILL

As you can well appreciate this is a subject about which books can be written. In fact the PATTERNMAKER'S MANUAL, *published by the AFS, covers Tooth Gearing Patterns (Chapter 11) and Propeller Patterns (Chapter 12).—Editor.*

Circle No. 140, Page 7-8

committees in action

■ It is advantageous for foundrymen to know whether shell cores and molds will possess desirable characteristics such as collapsibility, inhibitor effectiveness, and casting surface quality. In order to predict these properties in advance, the Shell Molding Committee of the Light Metals Division has developed a *Tentative Standard Collapsibility Test*. The complete details of the test will be published in a future issue of MODERN CASTINGS.

This committee met at the Case Institute of Technology on Jan. 29 to study the procedure and equipment needs for pouring collapsibility test specimens. A number of specimens were poured using different shell molding mixes. The mixes were evaluated on the basis of tensile strength, quality of shakeout, core friability, and scratch hardness.

■ Chapters of the *"Radiation Protection Manual"* continue to occupy the efforts of the Radiation Protection Committee. Work is in process on the preface, a glossary of terms to aid the reader, and a chapter entitled *"Internal and External Hazards."* The Chapter on *"Radiographic Procedures"* is completed. Sections in this chapter are (1) choice of unit, (2) location, (3) design, (4) protective materials, (5) radiation scatter, (6) fixed sources, (7) portable sources, and (8) individual checks.

In a similar manner, the Noise Control Committee is engrossed in the production of the *"Foundry Noise Manual."* Chapters now in the process of preparation are entitled:

Physiological Aspects of Hearing and Hearing Loss
Medical Supervision of Workers Exposed to Excessive Noise
Personal Protective Equipment
Engineering Control of Noise

As each of the *Manual* chapters are approved they will be published in abstract form in MODERN CASTINGS.

new books

Survey of the CO_2 Process for Core and Mould Making . . British Non-Ferrous Metals Research Association. 44 p. Association of Bronze and Brass Founders, 69, Harborne Rd, Edgbaston, Birmingham 15, England. 1956. 5 shillings.

A report of the carbon dioxide/sodium silicate process is made following a survey in which fifteen foundries were visited and discussions held with the major suppliers of binder and gas. Thirty-two references, mostly foreign, are included.

Bibliographic Survey of Corrosion 1952-1953 . . 382 p. National Association of Corrosion Engineers, 1061 M & M Building, Houston 2, Texas. 1956. NACE members $10, others $12.50.

Summaries of 3344 corrosion and corrosion prevention articles, books, and brochures published during 1952-53 are compiled in this volume. Abstracts are arranged topically according to the NACE abstract filing index, which divides the literature into eight main groups: general, testing, characteristic corrosion phenomena, corrosive environments, preventive measures, materials of construction, equipment and industries. Each main group is subdivided. Topical cross-references are appended to each section. The subject index, in addition to terms in the NACE abstract filing index, lists many metals and alloys by trade name and indexes them as to specific properties and to behavior in specific media.

Ryland's Coal, Iron, Steel, Tinplate, Metal, Engineering, Foundry, Hardware and Allied Trades Directory—1956 . . (32d ed.) 2143 p. Industrial Newspapers, Ltd., John Adam House, 17/19, John Adam St., Adelphi, London, W.C.2, England. 1956. $11.

This directory is divided into three sections: alphabetical, geographical, and classified trades. In addition to covering the trades listed in the title, it lists towns and places, telegraphic addresses, brands, trade marks, and trade names, trade and technical associations, and unions. A separate section contains information on companies in the British Commonwealth.

Iron and Steel Today . . (2d ed.) John Dearden. 271 p. Oxford University Press, 114 Fifth Ave., New York 11. 1956. $2.

The chapters include: wrought iron; pig iron; the iron foundry; steel—the Bessemer process; steel—the open-hearth process; further developments of the basic open-hearth process; electric steelmaking; the casting of steel; the working of steel; tool steel; mechanical testing and heat treatment; carbon and alloy structural steels; corrosion-, heat-, and wear-resisting steels; magnet steels; and post-war developments. The appendix

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covers: the location of the industry in Britain; prices of iron and steel products; finished steel in Britain; imports and exports; the European Coal and Steel Community; international trade in steel; steel consumption per head; labor and capital.

Accident Facts . . (1956 ed.) 98 p. National Safety Council, 425 N. Michigan Ave., Chicago 11. 1956. $1.

Detailed statistics are shown on the type of accidents that cause the most injuries or deaths . . . accident rates . . . primary causes for specific types of accidents . . . relationship between accidents and age, sex, time of year, geographical location . . . number of people killed or injured in 1955 in all types of accidents . . . cost of accidents to the nation in terms of compensation, medical expenses, insurance, etc.

Industrial Engineering Handbook . . Harold B. Maynard. (ed.-in-chief) 1504 p. McGraw-Hill Co., 330 W. 42nd St., New York 36. 1956. $17.50.

Eighty-one authors have contributed to this book which is divided into eight sections: industrial engineering function; methods; work measurement; predetermined-elemental-time standards; wage payment; control procedures; plant facilities and design; and other aspects of industrial engineering.

Structural Chemistry and Metallurgy of Copper . . D. K. Crampton. 28 p. American Society for Testing Materials, 1916 Race St., Philadelphia 3. 1957. $1.50.

The Fifth Gillett Memorial Lecture discusses some of the new work on recrystallization and grain growth of copper alloys . . . the structural chemistry of copper and copper alloys . . . and new investigations of the fundamentals of corrosion and corrosion resistance of copper.

Magnesium Up-to-date . . 175 p. Magnesium Association, 122 E. 42nd St., New York. 1956. $5.

The Proceedings of the 12th Annual Convention include the complete text of the 11 papers presented. Use of magnesium in field tele-typewriter, electric motor, truck body, dictating and recording equipment, wave guides, the outer space satellite, and military electronics are discussed. Other papers include: Effect of section thickness and microstructure of AZ91 heat-treated and aged magnesium castings and Magnesium-thorium alloys . . . their characteristics and properties.

Procedures for Risering Steel Castings . . H. F. Bishop and W. H. Johnson. 18 pp. Office of Technical Services, U. S. Dept. of Commerce, Washington 25, D. C. 1955, 50 cents.

Applications of rules for scientifically risering steel castings, described in previous NRL reports are shown for several commercial type castings. Cases are shown where riser locations are determined using formulae for (1) riser feeding range in uniform sections, (2) feeding range in heavy and light parent-

appendage combinations, and (3) the application of chills to increase riser feeding range. Procedures for the calculation of minimum riser dimensions for these castings are shown; these include cases where single and multiple risers are required, and where thin sections are joined to heavy sections.

The Die Casting Process . . H. K. Barton. 224 pp. Macmillan Co., 60 Fifth Ave., New York 11. 1957, $5.

The various phases of die casting from design, through production, finishing, and purchasing are discussed in 11 chapters. Appendices list die casting alloys, machining and polishing recommendations, chromium plating specifications, glossary of imperfections in die castings, die steels, specifications, bibliography, and tables.

Elements of Foundry Costing . . H. P. Court and W. E. Harrison. 79 pp. The Council of Ironfoundry Associations, 14, Pall Mall, London, S.W. 1, England. 1956.

Written by two cost and works accountants, the book is organized into chapters which discusses different departments of the foundry. The book is useful to small and large organizations. Sample tables and worksheets are shown and one chapter is devoted to grouping data from all departments for an overall accounting.

National Fire Codes, 1956. National Fire Protection Association, 60 Batterymarch St., Boston 10. 1956, $6 each.

Vol. 1, Flammable Liquids and Gases . . . 860 pp. Vol. 2, Combustible Solids, Dusts, Chemicals and Explosives, 616 pp. Vol. 3, Building Construction and Equipment, 704 pp. Vol. 4, Extinguishing Equipment, 1024 pp. Vol. 5, Electrical, 704 pp. Vol. 6, Transportation and Misc., 528 pp.

The six volumes contain 174 separate standards, many revised or new in 1956.

Design of Die Castings . . Gustav Lieby. 199 pp. American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill. 1957. AFS members $5.25, others $8.

This translation of the German book, *"Gestaltung von Druckgussteilen"* discusses methods, materials, design, construction, and economy of die castings. An extensive bibliography, not included in the original, has been appended.

Metallurgy . . (4th edn.) Carl G. Johnson and William R. Weeks, 454 pp. American Technical Society, 848 E. 58th St., Chicago 37. 1956, $5.50.

In addition to bringing the information in the 1956 edition up-to-date, a chapter on titanium, zirconium, indium, and vanadium has been added. Quiz questions are included at the end of each chapter.

Manufacturing Methods and Processes . . Arthur C. Ansley. 561 pp. Chilton Co., Chestnut and 56th Sts., Philadelphia 39. 1957, $12.50.

A non-technical presentation of the latest manufacturing processes for the executive, purchasing agent, engineer, and production man. Covers casting processes, stamping, forming, forging, extru-

sion, powder metallurgy, ultrasonic machining, heat treating, plastics, assembly and finishing, inspection and gaging, woodworking, ceramics, electronic printed circuits, and automation.

Encyclopedia of Chemistry . . George L. Clark and Gessner G. Hawley. 1037 pp. Reinhold Publishing Corp., Dept. 2810, 430 Park Ave., New York 22. 1957, $19.50.

More than 500 contributors from American science and industry have written the 850 articles, which range in length from 300 to 4000 words and cover subjects of chemical importance. Some topics describe well known chemical groups. Others discuss chemical concepts and reaction types. Others present topics which, though not immediately chemical in nature, can be regarded from a chemical point of view, such as abrasives and automatic process control. Broad topics such as metals are treated in a general discussion, together with separate articles dealing with many subdivisions of the main topic. Biographical sketches of outstanding figures in chemistry and descriptions of the leading chemical organizations and technical societies are also included.

Federation of British Industries Register of British Manufacturers—1957 (29th edn.) 1125 pp. Illiffe and Sons Ltd., Dorset House, Stamford St., London SE 1, England. 1956, 42 shillings.

The directory lists the products and services of over 7000 member firms of the Federation of British Industries cross indexed under 5400 alphabetical headings. In addition to the classified buyers' guide seven sections give addresses of companies, trade associations, proprietary names, trade marks, etc.

Effect of Vacuum Degassing on Properties of Various Aluminum Alloys . . PB 121325 E. E. Layne and H. F. Bishop. 11 pp. Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. 1956, 50 cents.

The improvement in mechanical properties produced in various aluminum alloy castings as the result of vacuum degassing of the melts was determined for different melt compositions, section thicknesses, and mold media. It was shown that further improvements in tensile strengths, yield strengths, and elongations are effected by the vacuum degassing treatment. Naval Research Laboratory Report 4797.

Guide for Safety in the Chemical Laboratory . . Manufacturing Chemists' Association. 247 pp. D. Van Nostrand Co., 120 Alexander St., Princeton, N. J. 1954, $4.50.

Lists recommended safety practices in the handling of hazardous chemicals; general rules for the design and construction of a safe and efficient laboratory; necessary equipment and service facilities; precautionary methods and personal protective equipment; descriptions of hazards; first aid, and suggested medical treatment.

NANCY EDDY, *Librarian*
American Foundrymen's Society

for the asking

Heat and corrosion resistant alloy casting applications is subject of 48-p catalog. Sections give general information on the alloys and their

industrial uses. Illustrated with tables, charts and photos. *International Nickel Co.*

Circle No. 61, Page 7-8

Cupola and charging equipment catalog, 36 pp, contains 84 photos and line drawings to illustrate principles and applications. Explains automatic cupola charging. *Modern Equipment Co.*

Circle No. 62, Page 7-8

Airless blast cleaning in soil pipe foundries is subject of bulletin explaining how pipe and fittings are cleaned automatically. Performance data included with photos of equipment. *Wheelabrator Corp.*

Circle No. 63, Page 7-8

Bentonite additions and their effect in bonding sand mixtures is covered in 1-p data sheet. Also discusses roles of water, cereal, and hand ramming. *American Colloid Co.*

Circle No. 64, Page 7-8

Sand process increases toughness and flowability. Two products are used, their balance controls flowability, toughness, shakeout and moisture content. Bulletin explains and illustrates properties of treated sands and case histories. *Eastern Clay Products Dept., International Minerals and Chemical Corp.*

Circle No. 65, Page 7-8

Ferro alloys and metals, 104 pp, contains history, properties and uses for B, Ca, Cr, Cb, Mn, Si, Ti, W, Va, Zr and their alloys. *Electro Metallurgical Co. Div., Union Carbide Corp.*

Circle No. 66, Page 7-8

Ductile iron catalog, 30 pp, covers castability, tensile and yield strengths, relationship between tensile properties and hardness, other mechanical properties, heat treatment, typical applications and economies of the metal. Illustrations show product applications. *International Nickel Co.*

Circle No. 67, Page 7-8

Fluorescent penetrant materials and techniques for using on non-magnetic materials are explained in 16-p bulletin on defects. Tables outline

specifications for penetrants and recommendations for various conditions. Also contains section on how various testing materials effect inspection results. *Magnaflux Corp.*

Circle No. 68, Page 7-8

Shell molding brochure, 38 pp, discusses the process including techniques in making patterns, draft, gates and risers, ejection, ovens, mixing equipment, sand, resins, and other data for best results. *Durez Plastics & Chemicals, Inc.*

Circle No. 69, Page 7-8

Organic binder for skin dried, dry sand and green sand molds and cores is reviewed in 4-p bulletin. Said to be 98% volatile, leaving no excessive ash for sand contamination. *Delta Oil Products Co.*

Circle No. 70, Page 7-8

V-Belt and sheave data book, 112 pp, contains charts, tables and diagrams with specifications for all drive sizes. Selection of proper equipment made possible by standard drive tables. Covers both theoretical and practical applications. *Manhattan Rubber Div., Raybestos-Manhattan, Inc.*

Circle No. 71, Page 7-8

Sand, how it is obtained and processed, is explained in 4-p folder. Photos show step-by-step procedure from pit to packaging. *Wedron Silica Co.*

Circle No. 72, Page 7-8

Gray iron castings and their importance to industry outlined in 20-p brochure. Includes advantage of cast-

ings and key steps in their production. *Coke & Iron Div., Pittsburgh Coke & Chemical Co.*

Circle No. 73, Page 7-8

Shell molding instruction leaflet outlines procedures for using silicone parting agents in shell molding. Advantages and limitations of all types

of agents are discussed, including compounds, emulsions and various solvent solutions. One section covers breaking-in and cleaning patterns. *Dow Corning Corp.*

Circle No. 74, Page 7-8

Graphitization alloy data sheet, 4 pp, describes use in deoxidation and inoculation of iron. Charts show effect on chill depth and tensile strength. *Vanadium Corp. of America.*

Circle No. 75, Page 7-8

Bentonite, how it is obtained and processing steps involved are explained in 4-p reprint. *Magnet Cove Barium Corp.*

Circle No. 76, Page 7-8

Shot and grit booklet, 18 pp, describes chilled iron, annealed abrasives and factors to be considered in blast cleaning and peening operations. *Hickman, Williams & Co.*

Circle No. 77, Page 7-8

DC crane control bulletin, 8 pp, features precision hoist, bridge, and trolley control system. Provides product descriptions, typical speed-load curves, and components. *General Electric Co.*

Circle No. 78, Page 7-8

Fork lift safety kit contains hints on operation and safety aids, including directional and warning signs. *Towmotor Corp.*

Circle No. 79, Page 7-8

Hand traveling crane catalog, 4pp, outlines construction details, weights, and dimensions on models having 50-

Circle No. 146, Page 7-8

ft span and 3-10 ton capacity. *Wright Hoist Div., American Chain & Cable Co.*

Circle No. 80, Page 7-8

Surface pyrometer catalog, 4 pp, discusses five models with interchangeable thermocouples and extension arms. Also gives industrial and laboratory applications. *Pyrometer Instrument Co., Inc.*

Circle No. 81, Page 7-8

Air treatment bulletin, 4 pp, discusses heating and ventilating units, industrial heaters, and air conditioning units. Illustrates disposable filter which is rolled on spools. *American Air Filter Co.*

Circle No. 82, Page 7-8

Metal abrasive catalog, 12 pp, lists factors for selecting media, also characteristics and uses. Discusses shot peening and impact cleaning. Three charts show S.A.E. shot specifications. *Cleveland Metal Abrasive Co.*

Circle No. 83, Page 7-8

Induction heating units and accessories catalog, 8 pp, describes construction, operation, and application of motor-generator sets. Also contains details on cooling systems for sets and various transformer and capacitor accessories. *Westinghouse Electric Co.*

Circle No. 84, Page 7-8

Stress analysis bulletin explains technique for combining photoelasticity and bonded strain gages. System changes stress levels into contrasting colors which are analyzed. *Tatnall Measuring Systems Co.*

Circle No. 85, Page 7-8

Oil burner data sheet explains principle of operations for units with or without induced air. Burner capacities and dimensions are covered in charts. One page devoted to burner accessories. *Hauck Mfg. Co.*

Circle No. 86, Page 7-8

Stainless steel types "308, 309, and 310" are highlighted in 8-p booklet with physical properties, heat treatments, elevated temperature strength, fatigue strength and oxidation resistance. Steels used in furnace parts, boiler baffles, fire box sheets and oven linings. *Allegheny Ludlum Steel Corp.*

Circle No. 87, Page 7-8

Mortar bulletin, 6 pp, illustrates tests, applications and products; gives general and technical information on eleven regular and special grades. Details include six specialty refrac-

tory mortars with tables providing information on temperatures, type of setting, and gallons required for dipping, trowelling and brushing. *J. H. France Refractories Co.*

Circle No. 88, Page 7-8

Pneumatic vibrators and applications in foundries are outlined in 16 pp catalog. Photos show equipment in use from unloading to shakeout. Also contains model specifications. *Cleveland Vibrator Co.*

Circle No. 89, Page 7-8

Castable refractory data sheets describe general-purpose patch for hot and cold uses to 2900 F and high-temperature refractory for service to 3350 F. *Chas. Taylor & Sons Co.*

Circle No. 90, Page 7-8

Barrel finishing bulletin, 14 pp, features case histories of cleaning and finishing operations. Also contains before-and-after pictures of a variety of cleaned parts as well as charts indexing types of media and compounds and their uses. *Minnesota Mining & Mfg. Co.*

Circle No. 91, Page 7-8

Carbide data sheets give typical applications, analyses, physical characteristics and explanation of color code. One grade used for machining steel; another for non-ferrous and cast iron. *Carmet Div., Allegheny Ludlum Steel Corp.*

Circle No. 92, Page 7-8

Swing frame grinder catalog details specifications on six models and applications. Photos show equipment used in grinding castings. Balancing weights have been eliminated. *Mumert-Dixon Co.*

Circle No. 93, Page 7-8

Silicon carbide heating element catalog, 12 pp, gives typical applications and hints on storing, installation, and replacing. Recommended for heat treating, annealing and melting operations. *Globar Div., Carborundum Co.*

Circle No. 94, Page 7-8

Plastics in the foundry industry, 60-p brochure, illustrates fabrication methods for core driers, core boxes, matchplates, patterns, and core prints. Summarizes proper design of molds and preparation of mold surfaces. *Marblette Corp.*

Circle No. 95, Page 7-8

Spectrographic analysis brochure, 24 pp, gives specifications for arc and spark units, stands, attachments, and accessories for both direct reading

and photographic analysis. Also contains description of design and application of a variety of excitation source units. *Jarrell-Ash Co.*

Circle No. 96, Page 7-8

Bearing lubrication bulletin discusses relief-type fittings attached to bearing housings of motors, machines or pillow boxes. Said to prevent overlubrication of ball and roller bearings and cut maintenance time. *Keystone Lubricating Co.*

Circle No. 97, Page 7-8

Core and mold additive brochure, 4 pp, covers use in improving casting finish and reduction in cleaning time. May be applied by dipping or spraying. *United Oil Mfg. Co.*

Circle No. 98, Page 7-8

Dust collector bulletin, 8 pp, illustrates principle of utilizing louvres for dust separation. Charts show influence of dust particles on collection efficiency. Typical efficiencies in removing various materials listed. *Aerodyne Development Corp.*

Circle No. 99, Page 7-8

Torch cutting, gouging, beveling, and grooving of metals using DC welding machine and compressed air is explained in 4-p bulletin. Photos show foundry applications. *Arcair Co.*

Circle No. 100, Page 7-8

Ni-resist, engineering properties and applications catalog, 64 pp, lists applications and corrosion data. Photos show equipment in use and comparison with previous metals used. *International Nickel Co.*

Circle No. 101, Page 7-8

Aluminum alloy designations converted from old to new are contained in chart form. Also included are six charts on selection of alloys and fluxes to weld, braze and solder aluminum. *All-State Welding Alloys Co., Inc.*

Circle No. 102, Page 7-8

Abrasive chips and media bulletin, 4 pp, outlines various shapes and sizes for mass production barrel finishing. *Macklin Co.*

Circle No. 103, Page 7-8

Magnetic belt conveyor bulletin illustrates use in automatically handling small ferrous castings. Available in three sizes. *Rapids-Standard Co.*

Circle No. 104, Page 7-8

Corrosive fumes and atmosphere, 4-p folder, deals with exhaust fumes from corrosive chemicals. Included are plastic fans, rubber-lined and coated

blowers, plastic and rubber-lined ejector units, and coated axial fans. *Heil Process Equipment Corp.*

Circle No. 105, Page 7-8

Zirconium and hafnium booklet, 12 pp, describes their uses, mechanical and physical properties and the sodium process for extracting the metals. Also contains information on zirconium alloys systems and parts fabrication. *U. S. Industrial Chemicals Co. Div., National Distillers Products Corp.*

Circle No. 106, Page 7-8

Spectrographic planning manual, 32 pp, describes line of equipment including accessories and auxiliary equipment. Also gives recommendations as to selection of proper equipment. *Bausch & Lomb Optical Co.*

Circle No. 107, Page 7-8

Alloys, fluxes and **deoxidizers** for non-ferrous metals are described in 6-p bulletin. Literature includes procedures for use. *Niagara Falls Smelting & Refining Div., Continental Copper & Steel Industries, Inc.*

Circle No. 108, Page 7-8

Metallizing bulletin describes process of spraying molten metal on base surface to reclaim castings, build up worn equipment and to apply hard wearing surfaces. *Protective Coatings Div., Metalweld, Inc.*

Circle No. 109, Page 7-8

Hose coupling bulletin outlines quick-connect units using teflon seals throughout. For use with acids, alkalies, solvents, and high pressure steam. Detailed cutaway of coupling included. *Snap-Tite, Inc.*

Circle No. 110, Page 7-8

Shell molding process bulletin, 38 pp, contains historical background, synopsis of the process, equipment and material requirements, practical considerations of the process and its limitations. *Monsanto Chemical Co.*

Circle No. 111, Page 7-8

Lift truck catalog, 24 pp, provides information on manually-propelled, battery-operated hydraulic lift trucks. Models include stradle, counterweighted, telescopic, and adjustable fork lift types. *Big Joe Mfg. Co.*

Circle No. 112, Page 7-8

Answer questions by sending for data describing the newest products and processes. Order by using cards on **page 7-8.**

Two Overseas Conventions to Hear Four AFS Authors

Four American technical papers will be presented this year in foreign countries under the auspices of the American Foundrymen's Society. Three will be given at the 24th International Foundry Congress to be held August 19-24 at Stockholm, Sweden. These are: *"The Foundry Environment,* H. J. Weber, AFS Director of Safety, Hygiene and Air Pollution; *"Automatic Tempering of Molding Sand,"* AFS President Harry W. Dietert, Harry W. Dietert Co., Detroit; and *"Engineering Aspects of Core* Dike-O-Seal, Inc., Chicago.

Technical papers from more than a score of countries have been scheduled at the International Congress. Subjects include ductile iron, CO_2 developments, plastic core materials, hot-blast cupola balance, aging of cast light metals, iron oxidation, foundry health and ventilation, hot tear investigations, and molding sand practice.

The International Congress is sponsored by the International Committee of Foundry Technical Associations comprising technical foundry groups in 17 countries. In America, AFS is the sole member.

Presiding at the Foundry Congress will be the International President, Dr. A. B. Everest of London, England. General Secretary of the Congress is Lars Villner of Stockholm.

Sweden, Norway, Denmark, and Finland are organizing the International Congress. Sweden will act as host.

Exchange papers will be summarized in English, French, and German. Preprints will be mailed to registered participants but printed only in the language in which received.

Non-participants may purchase preprints direct from the Swedish association, Severiges Mekanforbund, Karlavagen, 43, Stockholm O, Sweden.

An extensive list of modern foundries will be open to visitors. Organized work tours are scheduled including six in Sweden and one in Finland.

Other events include a banquet and visits to art shows and museums.

Milton Tilley, metallurgist, National Malleable & Steel Casting Co., Cleveland, will author the official exchange paper at the Institute of British Foundrymen, Australian Branch. His subject will be *"Modern American Pearlitic Malleable Iron Practice."* It will be presented at the Convention of the Australian-Branch, Institute of British Foundrymen, during November, is Australia.

61st AFS Casting Congress and Engineered Castings Show News Story

Over 5400 registration sets new record foundrymen, designers, and buyers view castings exhibits

The metal casting industry held open house and displayed both its technology and its products to all industry at the combined American Foundrymen's Society Castings Congress and 1st Engineered Castings Show in Cincinnati May 6-10. A record-smashing crowd of over 5,400 foundrymen, design engineers and buyers crowded into Cincinnati for the successful events.

Registered attendance during just the first two days of the event was larger than the total attendance for any previous alternate-year AFS Castings Congress.

Record attendance resulted from a technical program and an exhibit in which the progress and achievements of the castings industry were put on display for the industry's customers. Included in the technical program were several special sessions in which some of the industry's largest customers told foundrymen what was good about their cast product and also where improvement should be made.

AFS President Frank W. Shipley stated in the President's Annual Address at the society's annual business meeting that "the 1st Engineered Castings Show has been a success." He also announced that plans are being made for "a Second Castings Show which will definitely be held in 1959."

H. W. Dietert: new president heads over 13,000 members.

L. H. Durdin: now serving as Society vice-president.

F. W. Shipley: completed an eventful year with the AFS.

The annual business session was also the occasion for the first presentation of two new AFS awards, the Award of Scientific Merit and the AFS Service Citation. Service Citations were presented to Thomas E. Barlow, Horace A. Deane, and Vincent Delport. Actual presentation of the citation to Mr. Delport, AFS European representative will be made in Europe.

Awards of Scientific Merit were presented to Manley E. Brooks, Richard W. Heine, Walter R. Jaeschke, and Arthur E. Schuh. All presentations were made by E. W.

F. W. Shipley at AFS annual dinner thanks foundrymen for making his term one of the most successful of Society.

Over 5400 designers, buyers and foundrymen registered to make Cincinnati meeting best for any similar year.

Horlebein for the AFS Board of Awards.

During the business meeting the first-place winners in the Robert E. Kennedy Apprentice Contest were introduced (*Turn to page 75 for pictures of the winning entries and contestants.*) Winners of a special judging for Canadian apprentices were also announced.

Immediately following the business meeting, the Hoyt Memorial Lecture was given by Hyman Bornstein on the topic *"Progress in Iron Castings."*

New Officers Elected

The recommendations of the AFS national nominating committee were announced at the meeting and affirmative votes were cast for all nominees to national AFS offices. Harry W. Dietert was elected president, L. H. Durdin was elected vice-president, and the following were elected to three-year terms as national directors: Henry G. Stenberg, A. A. Hochrein, William D. Dunn, Fred J. Pfarr, Karl L. Landgrebe, Jr., John R. Russo, and Allen M. Slichter.

Charles E. Drury was appointed by the AFS Board of Directors in February to fill the unexpired term of R. V. Righter which expires in 1959.

President Frank W. Shipley presided at the AFS Annual Banquet event which attracted a capacity crowd of 600. Features of the evening were the presentation of three AFS Gold Medals, and a humorous speech by Warren Whitney, James B. Clow & Sons, Inc.

The Peter L. Simpson Gold Medal was awarded to Charles K. Donoho, Clyde A. Sanders was presented the John H. Whiting Gold Medal, and Johannes C. A. Croning was named for the John A. Penton Gold Medal. Mr. Croning, internationally - known German foundry scientist, was unable to attend the Castings Congress and a fellow German foundryman, Bernard Gebhardt, accepted the award for him.

AFS Honorary Life Memberships were presented to the Gold Medalists, to Hoyt Lecturer Bornstein, and to retiring President Frank W. Shipley. E. W. Horlebein made the presentations.

Twenty-one plants in the Cincinnati area opened their doors to the numerous Castings Congress visitors that wanted to see operating foundries. Some of the touring groups were large enough to require special buses. All arrangements for plant visits were handled by the Plant Visitation Committee of the AFS Cincinnati District Chapter. M. E. Rollman was chairman of this group.

Foundries are a good place to work judging by the number of old-timers attending the Castings Congress. Of the 63 registered, 35 had more than 25 years in the foundry industry.

Oldest in the point of age and service was M. E. Dolan, 90, retired, who had spent 65 years in the foundry line. Mr. Dolan, a resident of Louisville, Ky., has missed only one AFS convention since 1906.

Second oldest was James Thompson, 76, now retired of East Chicago, Ind., who had 52 years in the industry.

Four old-timers were present who are active, all with 47 years or more in the castings industry. Francis T. O'Hare, president of O'Hare Foundry Co., St. Louis, Mo., 74 years old, has been active in the line for 53 years. Charles Scoville, 64 years old, foundry foreman, Babcock & Wilcox Co., Barberton, Ohio, has 50 years service. William B. George, 64 years old, engineer, R. Lavin & Sons, Chicago, has completed 50 years in the foundry. Another old-timer was C. C. Mac Donald, 62 years old, with 47 years in the business, is a sales representative from Toronto, Canada.

An international air to the 61st Castings Congress and 1st Engineered Castings Show was given by the 34 registered foreign visitors from nine countries. Fourteen Germans represented the largest number from a single country.

Among the foreign dignitaries was P. J. Le Thomas, Association de Fonderie de France, Paris, France, who presented the official French exchange paper *"Relation of Microhardness and Stresses in Copper Alloys."*

The Canadian members of AFS held the traditional Canadian Dinner during the Castings Congress. Alex W. Pirrie, AFS director from Canada, was toastmaster and he introduced President Shipley and L. H. Durdin, vice-president-elect.

Members of the Board of Trustees of the AFS Training and Research Institute met during the Castings Congress and settled details of the first intensive foundry technology courses which are to be conducted by AFS this year.

Other special activities taking place during the Castings Congress were a business meeting and luncheon for the AFS Board of Directors, the Past Presidents' Luncheon at which Frank J. Dost presided, and the AFS Alumni Dinner at which B. L. Simpson presided.

Ladies Program

All ladies attending the Congress were invited to be the guests of the Society at the official AFS tea. Mrs. F. W. Shipley, Mrs. E. H. King, and Mrs. H. W. Dietert presided at the tea table and President Shipley and General Manager Wm. W. Maloney welcomed the guests on behalf of the society. Other features of the special program for the ladies included a fashion show luncheon, and a boat trip on the Ohio river.

More to Come

▪ These pages begin the first installment in the MODERN CASTINGS coverage of the great 61st AFS Castings Congress and 1st Engineered Castings Show. Many more photographs, summaries of the technical papers, and special features on the Congress and Show will appear in the July issue. So much news was made at these two important events that MODERN CASTINGS is devoting a large part of two issues to assure its readers of a complete picture of all events.

Greeting visitors at the President's Reception, left to right, Mrs. F. W. Shipley, President Shipley, and Mrs. Wm. W. Maloney. In the reception line, left to right, are F. W. Dost, B. L. Simpson, Mrs. Simpson, Mrs. Dost.

AFS dignitaries at the two head tables and a full house heard Warren Whitney discuss progress made in the past 50 years and the importance of maintaining moral and spiritual values during the next half-century.

1st Engineered Castings Show

The First Engineered Castings Show completed a highly successful five-day run, with 90 exhibitors providing an unprecedented display that attracted over 5400 design engineers, casting buyers, and foundrymen to the Music Hall in Cincinnati, May 6-10. Foundries, pattern shops, metals and alloys producers, and testing equipment manufacturers demonstrated the high quality of their products that have helped maintain this country as the number one industrial nation of the world.

Design engineers and castings buyers were able to view the greatest variety of castings ever accumulated under one roof in this country. Over 50 foundries displayed their casting "know-how" with an almost infinite collection of shapes and sizes, made from practically every castable alloy by all commercial techniques.

Thousands of miles of travel and many days would have been required to see the equal of one day's visit to the Engineered Castings Show. Exhibiting companies were located within an area bounded approximately by drawing a line from Danvers, Mass., to Buffalo, N. Y., to Vassar, Mich., to Milwaukee, to Keokuk, Iowa, to Kansas City, Mo., to St. Louis, to Birmingham, Ala., to Lynchburg, Va., to Baltimore, Md., to New York and back to Danvers. Registration showed that visitors ranged from East Coast to West Coast and from Mexico to Canada. In all, nine foreign countries were represented by visitors at the Show.

Castings on display were made from gray iron, malleable iron, ductile iron, steel, aluminum base, magnesium base, brass, bronze, copper, zinc base, and even titanium and zirconium. The casting processes involved in the production of these castings ran the complete gamut of foundry techniques, including: green sand; dry sand; core sand; shell and plaster molding; investment casting; permanent mold; die casting; centrifugal casting; and vacuum casting.

Visitors were attracted to Cincinnati to see how foundries are engineering castings for industry.

Superlatives ran rampant as castings producers outdid each other with examples of their skills in foundry processes. Castings were either the largest, or smallest, or smoothest, or cheapest—and always the best. Many examples showed marked economies effected by switching production to casting as a replacement for weldments, stampings, extrusions, or forgings.

In other instances one cast metal was effectively substituted for another, such as ductile iron for steel, with a substantial saving resulting. In other cases die casting proved to be a faster, cheaper, better way of mass-producing parts formerly sand cast. Or customer demands for closer as-cast dimensional tolerances required the casting process to be changed from green sand molding to shell molding.

Sometimes the shapes of the castings were so intricate that lost-wax investment casting was the only way they could possibly be manufactured. Several finished parts demonstrated how extruded or otherwise fabricated components were assembled into the finished article by positioning them in the mold cavity and joining with cast metal.

Design engineers and casting buyers in attendance had a "field day." Never could so much be learned about the casting process and producers in so little time. Aircraft companies proved their awareness of castings potentials by the large number of their engineers evident throughout the exhibit hall. One aircraft engineer said that if he had realized in advance the excellence of the Show he would have brought more men from his department and insisted on men from other branches attending.

He and many others expressed hopes that this type Show would be repeated in 1959. Another designer commented that the Show "had great value for manufacturing engineers since it gave them the opportunity through visual contact to evaluate the foundry industry's ability." Another visitor commented that the Show "acted as a bridge that closed the void between the user and producer."

MODERN CASTINGS interviewed a number of design engineers and castings buyers in attendance at the Show. These interviews will be published in the July issue of the magazine. It can be said that these men were all favorably im-

pressed and the castings industry has planted the seeds of future increased casting usage in the minds of the men who nucleate the requirements.

It was not uncommon to see visiting casting buyers pull blueprints out of their pocket and ask foundry exhibitors if they could supply castings to meet their requirements. In one classic example of efficiency a potential buyer was able to solve his problem by conferring with a pattern exhibitor and casting exhibitor. These three, normally separated by many miles were brought together by the Engineered Castings Show and mutually benefited.

Considering that this was the first time that many of the exhibitors had ever appeared in a national show, the quality of the displays and imagination used to bring their achievements to the attention of the visitors was indeed remarkable. Exhibit booths were in all cases manned by the most capable technical representatives of the company, prepared to answer any question posed them. In many instances the president or owner of the company was in attendance.

Many new potential customer contacts resulted from this week of cross-pollinating the ideas of castings producers, designers, and buyers. A large number of the "lookers" were foundrymen attending the Castings Congress, driven by an understandable curiosity to see what their competitors were doing. The excellent array of castings they saw was sufficient to inspire them to go back to their shops and strive to improve the quality of their product, because competition as demonstrated at the Show is keen.

Exhibiting for the first time anywhere, Peerless Foundry Co., Cincinnati, showed remarkable ingenuity by using a closed circuit television to demonstrate their foundry operations before the eyes of thousands attending the Show. Two TV screens located in their booth at the Music Hall attracted a large crowd four times every day when their foundry operations, 10 miles away, could be viewed on the screens.

Six different departments in the foundry were televised, including sand preparation and control, coremaking, floor and machine molding, cupola charging and cleaning.

The action was unrehearsed and narrated informally by Harry Placke, plant manager. In communication with the foundry by telephone he could ask for any operation to be repeated or viewed from a different angle if someone in the audience so desired. It is believed that this is the first time that a TV presentation of an actual foundry operation has been "piped" into an industrial exhibit.

Since the number of engineered castings on display was so great it is only possible to comment on a few of the unusual ones. With the aid of a fork lift truck, Morris Bean & Co. exhibited the largest aluminum mold for making "king-size" rubber tires. In the booth of Mueller Industries, Inc., was a six-ton gray iron wheel for polishing plate glass.

Kaiser Aluminum & Chemical Sales, Inc. showed the largest aluminum die casting in the world —a 75-lb. cylinder block. The largest aluminum sand casting at the Show was a 1500-lb. guided missile launcher base made and exhibited by Howard Foundry Co.

Attracting considerable interest was the collection of ancient Oriental artistic castings comprising the Sipi Metals Corp. exhibit. One of these,—a bronze Siamese temple gong—dated back to the 8th century. Another ornamental casting was that of Charlie Wooly, a life-size, 500-lb. iron statue of a grinning boy, a familiar fixture at the Broadmoor Hotel in Colorado Springs. Originally a cement figure, it had become broken into 20 pieces, which were carefully reconstructed into a pattern, molded, cast and exhibited at the Show by Hamilton Foundry & Machine Co.

Because titanium and zirconium must be carefully melted and cast in vacuum using a non-reactive graphite mold, the collection of castings in these materials evoked considerable comment in the booth of Oregon Metallurgical Corp.

Considerable space in the July issue of Modern Castings will be devoted to more detailed descriptions and photos of outstanding engineered castings that made their premier appearance in the 1st Engineered Castings Show.

Engineers arrived with prints and problems to consult exhibitors.

Televising of actual operations in a foundry attracted large crowds.

Exhibits were staffed with engineers to answer technical problems.

The Technical Program

Hoyt Lecturer H. Bornstein reviewed gray iron progress.

Foundrymen's keen desire to add to their knowledge of casting technology was demonstrated by unprecedented attendance at the 50 technical sessions, round table luncheons, and shop courses presented at the 61st Castings Congress.

In most instances meeting rooms were filled to capacity to hear outstanding speakers and papers covering the fields of malleable iron, pattern making, steel, statistical methods, castings engineering, safety, health, hearing, radiation, fundamental studies, sand, light metals, management, education, gray iron, brass, bronze, heat transfer, and industrial engineering.

More than 150 top men of the castings industry contributed to the five-day program which opened the door to the many new advances in foundry technology. Because of the great scope and impact of the technical program, MODERN CASTINGS is publishing a summary of every paper presented at the Congress. The considerable extent of this information requires that it appear in two issues of the magazine. Sessions not reported in this June issue will appear in July.

Hoyt Lecture

Progress in Iron Castings, Hyman Bornstein. The achievements of iron foundrymen during the period from about 1920 were reviewed in Mr. Bornstein's study of the development of gray and white iron castings, malleable and pearlitic malleable castings, and nodular iron castings. The review of gray iron progress was based on the history of specifications for iron castings. Mr. Bornstein stated that the following developments were the outstanding achievements in the advance of technology into iron foundry practice: increased use of steel in charges and the control of carbon content; use of alloying elements, singly or in combination; importance of mass effect and its control; the use of inoculants; use of heat treatment.

In his study of progress in malleable castings, Mr. Bornstein used the improved quality of the castings produced as a standard of measurement. He pointed to the use of duplexing as the reason for improved quality of malleable castings.

The short history of nodular iron was traced from its start in 1943 to the production of 250,000 tons of nodular iron castings in 1956.

Mr. Bornstein also commented separately on the influence of automation and new cupola developments. His closing remarks were devoted to the importance of casting quality and to the necessity of producing better castings. He said that, "Progress in castings has been tremendous in the past 25 years. But it will be necessary to have more rapid progress in the years to come because competition of other materials and processes is becoming more keen."

Continued on page 77

Service Citation winner, T. E. Barlow, left, shakes hands with E. W. Horlebein. Horace A. Deane, in center, also received the citation.

Scientific Merit winners, A. E. Schuh, R. W. Heine, W. R. Jaeschke, M. E. Brooks, focus their attention on award held by Mr. Horlebein.

For outstanding service to the industry, C. A. Sanders receives an AFS Gold Medal.

Outstanding work in ferrous casting field wins AFS Gold Medal for Charles K. Donoho.

President Shipley and C. E. Westover, left, congratulate W. J. Grede on his management talk.

A straight forward talk on foundries and the auto market by H. F. Barr impressed both President-Elect Dietert and President Shipley.

MOVING FOUNDRY MATERIALS—No. 2

PNEUMATIC CONVEYORS: Pipeline for Sand Handling

Safer, cleaner foundries result when sand moves overhead in sealed tubes extending anywhere in foundry

Elimination of moving parts, ease of installation, and ability to rapidly move large amounts of bulk materials have made the pneumatic conveyor a basic part of foundry handling systems.

The system requires a minimum of space, reduces dust problems, offers protection to materials and personnel, makes possible the handling of different granular ingredients, or mixes and reduces maintenance costs.

Pneumatic handling systems for granular materials operate essentially as follows: the material, such as molding sand, is gravity or conveyor fed into a weigh-hopper. The proper batch weight, determined by the capacity of the equipment is accumulated in the hopper. Beneath the hopper is located the heart of the system—a pressure vessel. The material flows from the hopper into the pressure vessel through an opening in its top. When fully charged, an electric or pneumatic gate valve is closed, sealing the chamber.

Compressed air from an air reserve tank is introduced to aerate or fluidize the material in the vessel. Air pressure is then utilized to carry the material through a system of pipes to any work station in the foundry where it is discharged into storage hoppers.

Advantages of System

Flexibility is one of the strong points of the system. This becomes more apparent when an installation is made in an existing plant layout. Bulk materials are moved by compressed air in any direction and anywhere a pipe can be located — underground, overhead, around existing machinery, or through walls. With the use of boosters, the system can be extended indefinitely.

Lost floor space is held to a minimum as pipes generally run overhead. Only simple supports and hangers are needed to suspend the pipe. Posts and trusses may be used when available.

From a main pipe line, materials can be diverted to branch lines leading to more than a dozen remote receiving stations. Special diversion switches are electrically operated at a master control point.

Many foundries use pneumatic conveyors for unloading sand from railway cars. Their most frequent use, however, is in supplying coremaking and molding stations with sand. Different sand mixtures can be handled alternately without contamination since the system is self-cleaning.

Compressed air is obtained from existing plant facilities. Systems operate in the range 15-95 psi air pressure and can move as much as 1500 lb. of material several hundred feet in a matter of seconds.

Dust Reduction

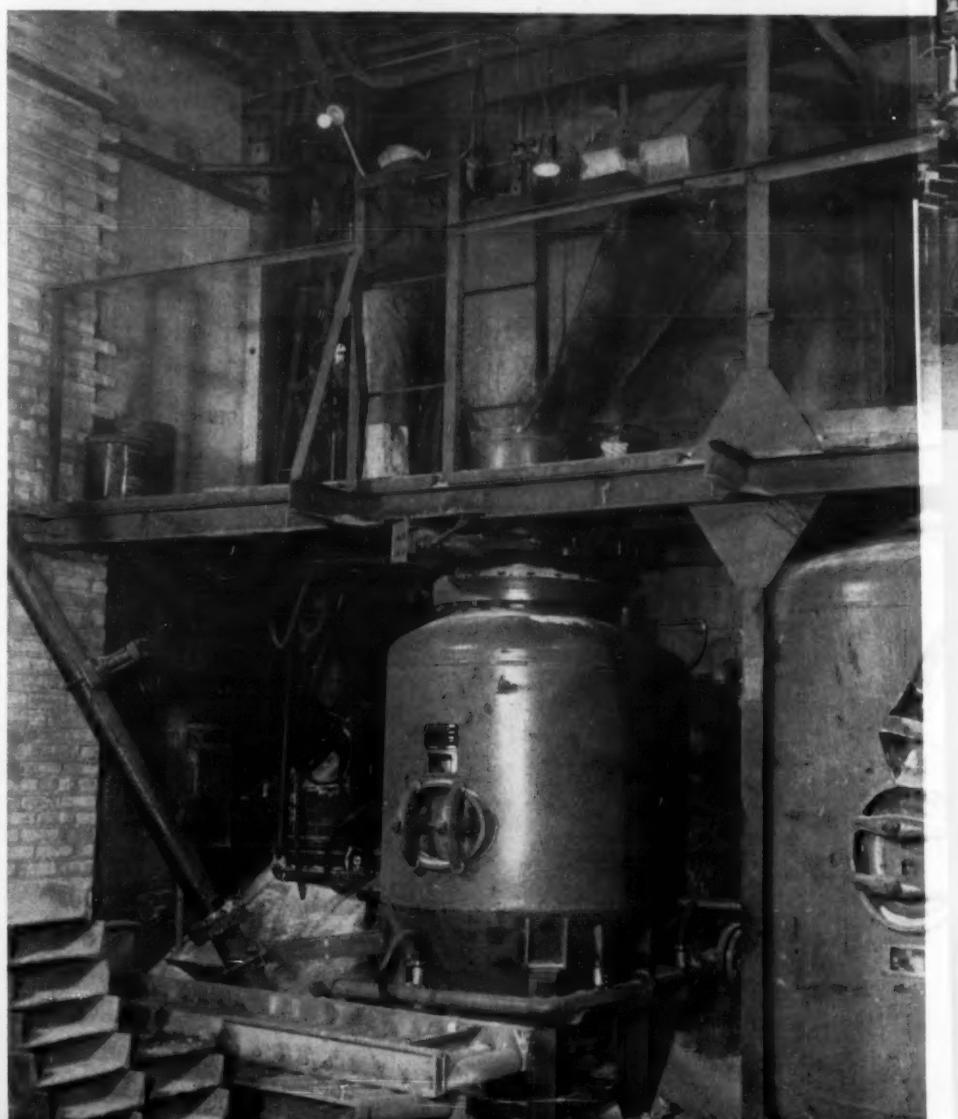
The dust problem is substantially reduced as materials move throughout the system completely enclosed in pipes. Floor workers are relieved from overhead hazards of falling materials since movement is safely confined.

Simplicity of the system with practically no moving parts results in lower maintenance costs. Some abrasion occurs at elbows and bends but these generally are changed at regular intervals. Areas receiving severe wear may be fortified with pipe having a heavier wall or made from a wear-resistant alloy. Heavy duty rubber-base pipe or elbows show good resistance to abrasive action.

Chicago Installation

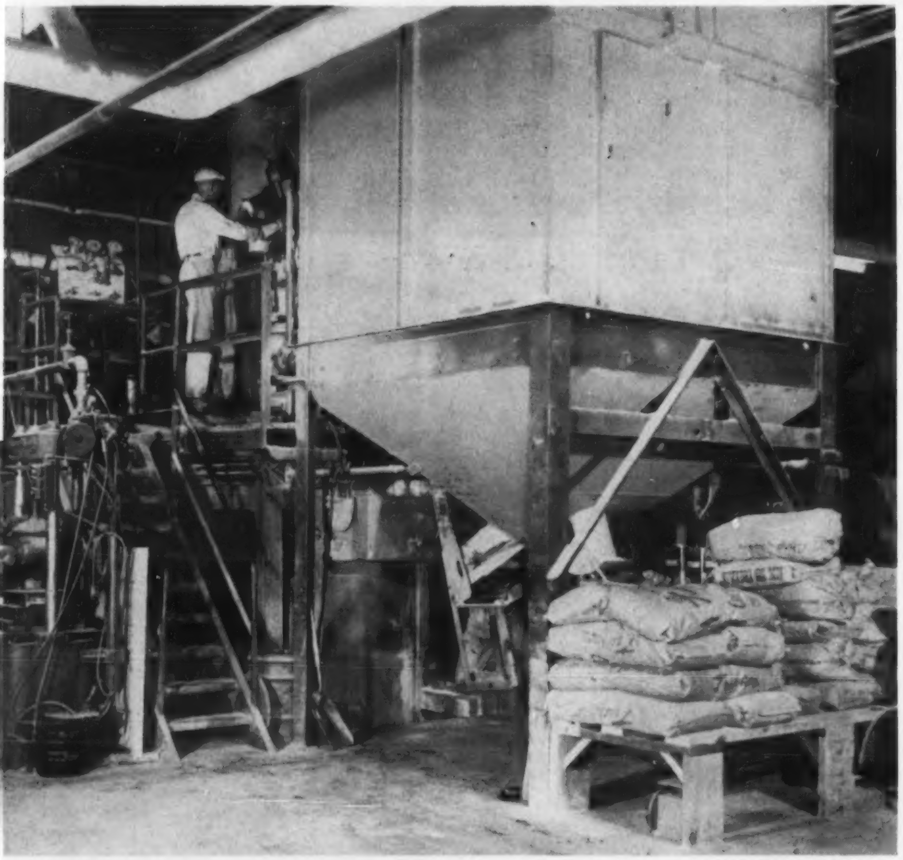
Most systems are operated by one man from a control panel resulting in substantial man-hour sav-

Daily core sand supply can be delivered by conveyor in 40 minutes.



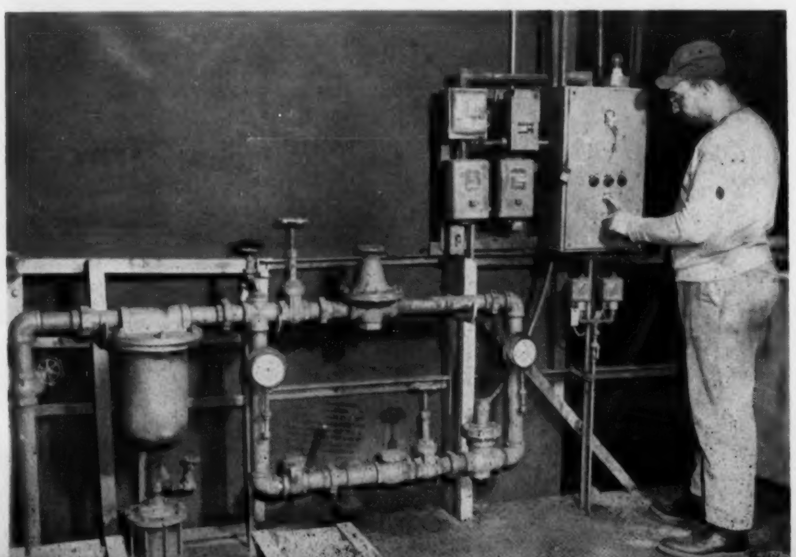
MOVING FOUNDRY MATERIALS—No. 2

PNEUMATIC CONVEYORS; Pipeline for Sand Handling



Cleaner shop results from handling of sand in enclosed system. Contamination of materials from outside sources is eliminated.

System can be automatic or semi-automatic. Complete batches of different materials may follow each other without danger of mixing.



ings. How the system operates in actual use is illustrated by a trip through a Chicago steel foundry where two pneumatic systems are used. One conveys new sand to the coreroom while the other transports prepared back-up sand to a sand-slinger operation.

Both pneumatic systems operate under 90 psi air pressure. Extra-heavy wall 4-in. pipes are used to convey sand from the pressure vessel to work stations.

In the pneumatic handling system for core sand, operation starts at the new sand storage bin located adjacent to the railroad tracks. A 1500 lb. batch of sand is drawn by gravity from the bin into a weigh-hopper situated on top of the pressure vessel. The batch drops into the vessel, gate valve is closed, and the sand blown through approximately 120 ft. of pipe to the core room.

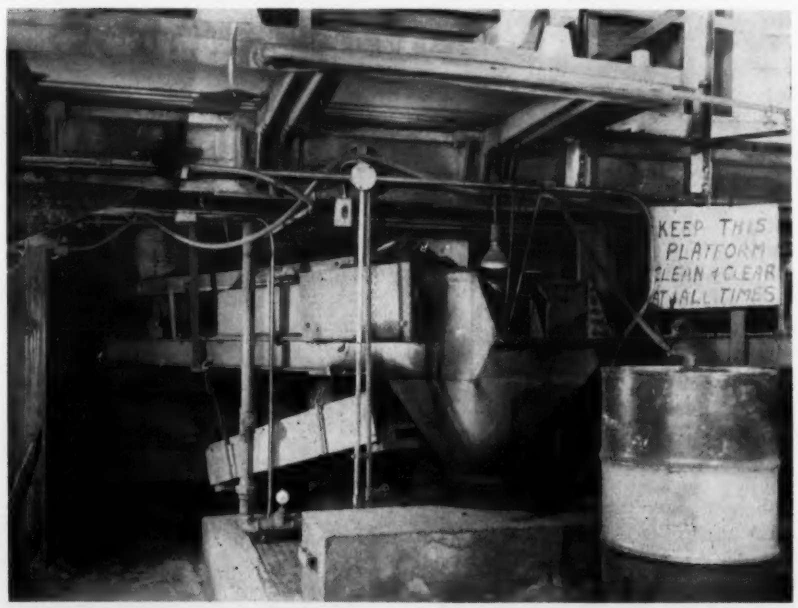
The pipe line takes advantage of the flexibility of the system. It extends from ground level almost to the roof before dropping into a 10-ton storage hopper in core room. Conveyor pipes will operate with any slope including vertical. The system could be made longer by adding boosters. Boosters also prevent line stoppage by augmenting air supply and maintaining directional spiral of material. A day's supply of sand is delivered to the core room in 40 minutes.

From the hopper, sand falls onto a weigh-scale. A skip hoist lifts sand into a muller where the molding mixture is prepared. Prepared core sand is delivered to core maker's benches by mechanical conveyors.

Since the sand is moving in a closed system, contamination of plant atmosphere with silica dust is held to a minimum. No evidence is seen of sand movement to the storage hopper other than 4-in. pipes which are high and out of the way. Pipes occupy no floor space, and no work area is lost due to the system.

Moving Green Sand

In the green sand molding area the system begins with two 40-ton storage bins. These bins hold sand returned from the adjacent shakeout area. Shakeout sand is fed by



Atomized release agent is added after mulling. This application, unique at Chicago foundry, adds lubrication to pipe, halts rusting.

a belt conveyor into a 1500 lb. muller. A short belt conveyor leads from the muller to a 1500 lb. sand capacity pressure vessel located below floor level.

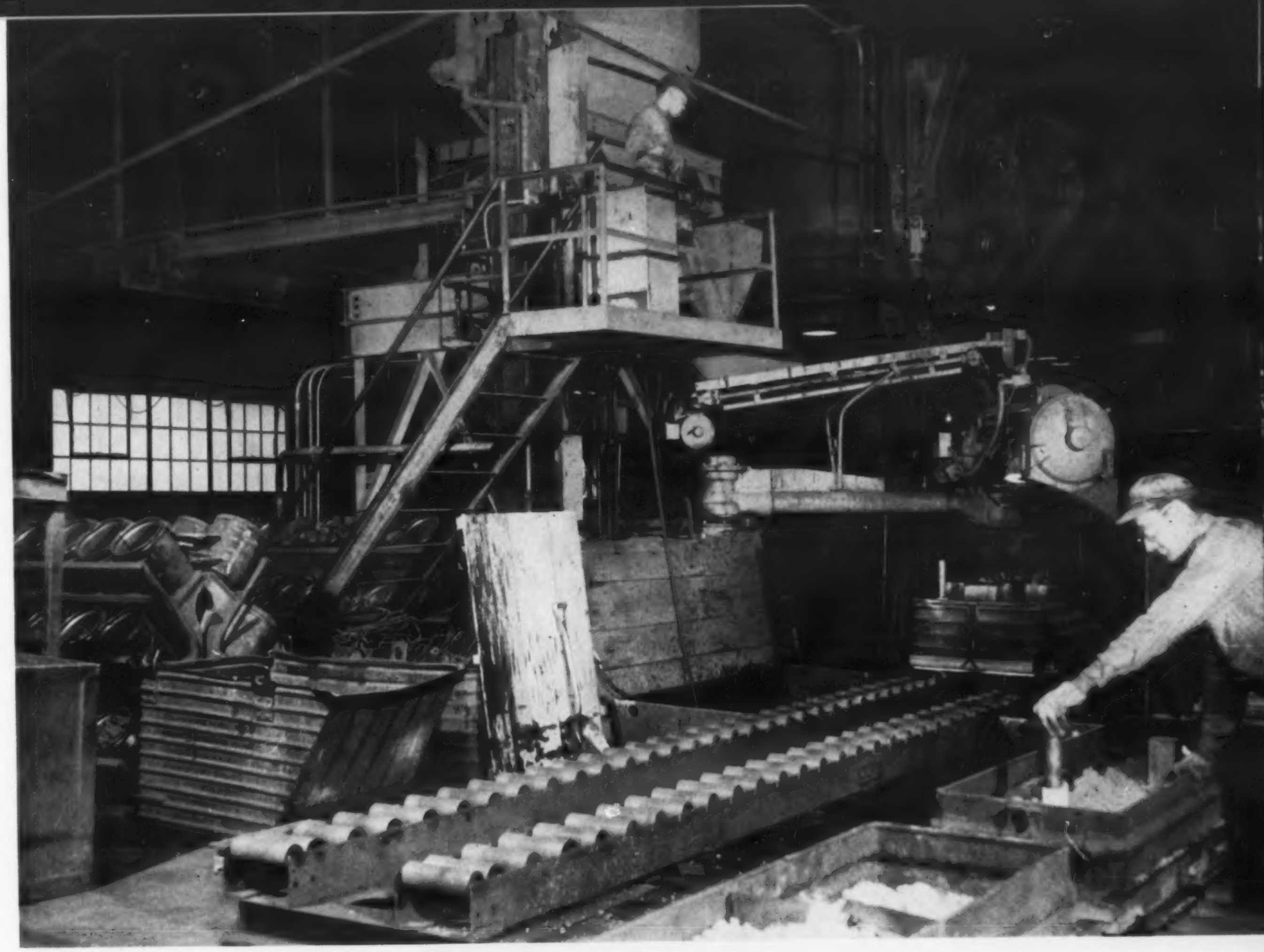
A jet of atomized release agent is sprayed into the pressure vessel for sand lubrication and as protection against pipe rusting. This spray method is said to be unique; other foundries using pneumatic systems reportedly add the release agent to the sand during mixing. Within seconds after the pressure vessel has been loaded, the sand travels at high speed for 70 ft. to a 10-ton storage bin. This backing sand is then fed into the sandslinger operation.

Installing the pneumatic sand conveying system and the slinger permit handling larger molds in a smaller space. This change eliminated five hoists and work stations as well as a belt conveying system formerly used for this operation.

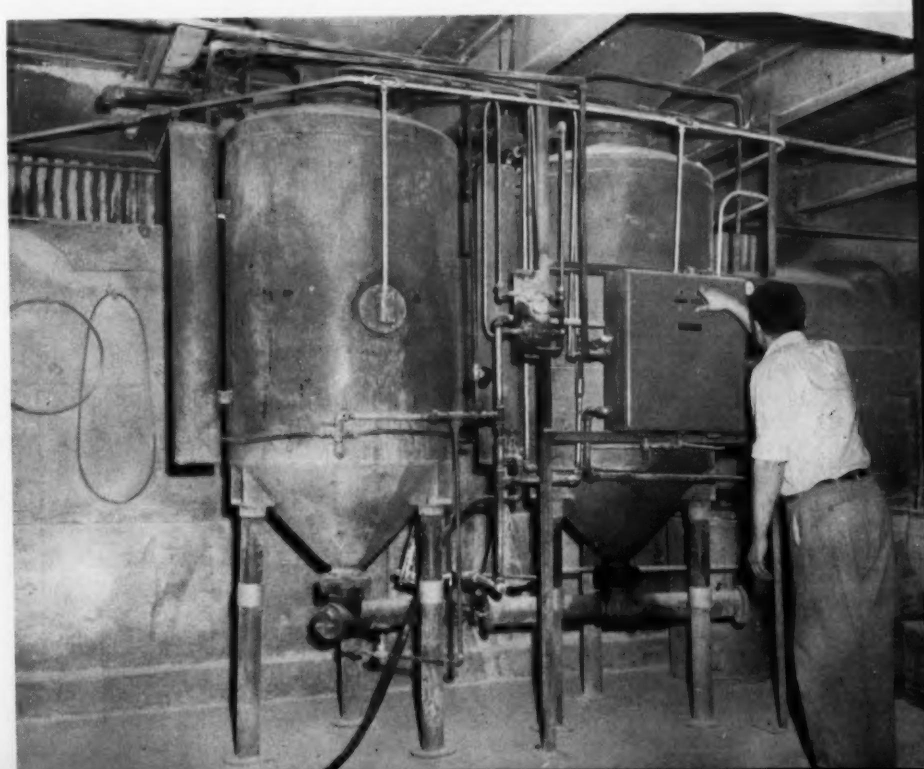
In the foundry of St. Louis Steel Casting, Inc., a similar type pneumatic system is used to convey corn flour and bentonite binders from the storage area to their sand muller. The two materials are gravity fed through a vibrating screen (to remove lumps) into pressure vessels located beneath and adjacent to each other. Air pressure at 15-17 psi aerates the material in the tank.

Using a venturi, binder is drawn from the cone-shaped bottom of the vessel and carried 50 feet to a muller through a 1-in. pipe. The muller operator controls this delivery with an electric switch. Bentonite arrives in a weigh hopper at the rate of about 1-lb. per sec. Two mullers are served by using a diversion switch in the line leading from the pressure vessel. Since silica flour dust is a health hazard, attempts were made to transport this sand mix ingredient in the confined safety of the pneumatic system. Unfortunately the extreme abrasive nature of this material results in serious erosion damage to the system.

The silence of the pneumatic system contrasts to the noise of foundry operations. The only evidence of action is a slight vibration in the pipes as the sand moves swiftly from the underground pressure vessel overhead to be deposited in the storage bin.



Installation of pneumatic system permitted addition of sandslinger operation; eliminated five electric hoists and work stations.



System at St. Louis Steel Castings, Inc. uses two pressure vessels for a system that delivers corn flour and bentonite.

The NEW LOOK in Cleaning Rooms

Cecil King / *Foundry Manager*
Dodge Foundry, Chrysler Corp.
Detroit

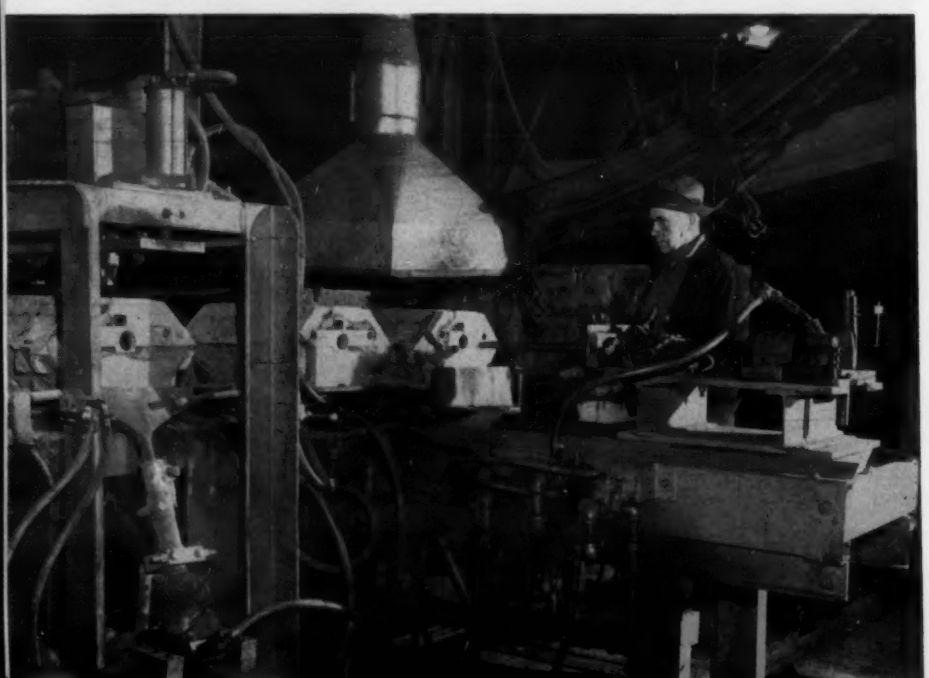
Dodge Foundry builds its own mechanized cylinder block cleaning department

Employees and visitors, who were familiar with the former dirty, crowded conditions of the foundry cleaning room in the Dodge Main Plant of Chrysler Corporation, still find it difficult to believe that such an operation could be transformed into the clean, quiet, highly mechanized operation as it exists today. Any automotive foundryman knows that dust, noise, sweat, and heavy work are the by-products of cleaning a gray iron V-8 cylinder block. Little has been done to decrease the hand chipping, air chipping, and grinding required to finish these complex castings.

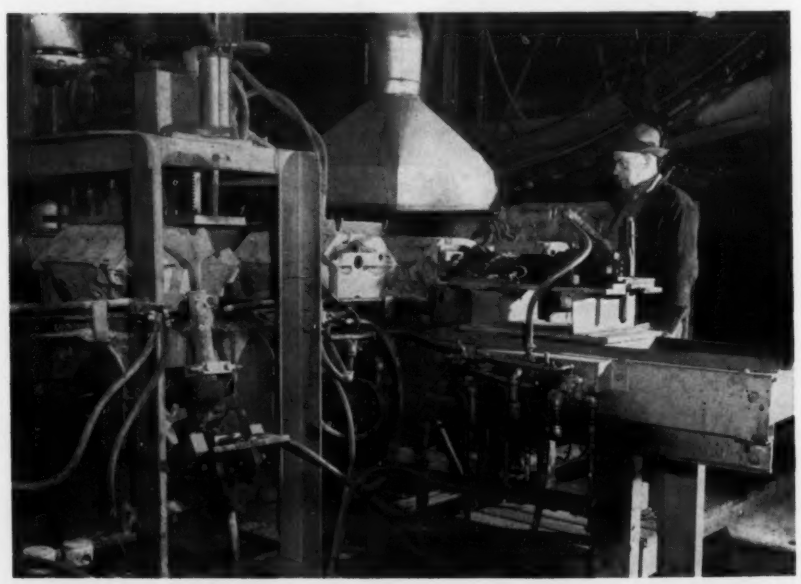
John R. Davis, general foreman of the foundry division and Peter Petcoff, general foreman of the cleaning room, agreed something could be done to better this situation. Enlisting the additional aid of Glenn McDaris, machine repair leader, and enthusiastic coopera-

Cylinder blocks move down inclined gravity roller conveyor. Front casting is starting across 16 in. grinding wheel moving at 1600 rpm.

Pneumatic hammers, formerly hand-operated, have been automated and rigged with a chisel and punching-bar to remove fins from motor blocks.



The chisel at station 3 and punch bar at station 5 have completed stroke which removes fins from end of block and cored holes within.



The author, Cecil King, foundry manager, and John R. Davis, general foreman of the Foundry Division, examine the air-hammer adaptation.

tion of the foundry maintenance departments, a revolution has been effected in the cylinder block cleaning line.

These men, through their ingenuity and persistent efforts, in a period of six and one half months, designed, built, experimented with, reworked and set into operation the first three sections of a semi-automated cylinder block cleaning line. Two more sections have since been added. During this time, they also faced the problems of daily production and preparations for the new 1957 engine. The efforts of these men resulted in many benefits to employees, the company and themselves. This article describes the equipment built, how it works, and the operations it performs on the cylinder blocks.

Benefits Dealer

In brief, the equipment was designed to remove burrs, fins and flashing from all surfaces and cored holes of cylinder blocks. The cleaning operations are performed by pneumatic powered mechanical devices located at various stations on an intermittent indexing shuttle conveyor. There are five separate units, each with five to seven stations. Some are spares designed into the system to permit additional operations that could arise from changes in casting design or processing.

As the result of this installation, the length of the cylinder block cleaning line has been reduced 50 per cent, expensive and difficult to maintain equipment has been eliminated, and much needed floor area has been made available for other use. The premium placed on working space can be appreciated by the fact that the only direction for growth in this plant has been vertical. So the foundry operation is now six stories high and is probably unique in that it operates without a scrap storage yard.

Since the cylinder block weighs 225 lb., heavy manual lifting was formerly all in a day's work and physical strength was the main prerequisite for employees in this department. The new cleaning line has eliminated all manual lifting and turning. Fatigue has been further reduced by conveying castings at a convenient working level for the men performing certain hand cleaning and inspection operations. As a result, the cleaning department is now manned by predominately older men. Yet with older men working in half the space, cleaning room capacity has been more than doubled.

The equipment was designed to move cylinder blocks through the department at a maximum rate of 240 per hour. However, the speed can be set at any lower rate. Currently the rate is 126 per hour to correspond to the casting output in the foundry and allow for perfect integration between the two departments.

Every effort has been made to clean the air as well as the casting. By locating dust collectors at points of potential air contamination, the cleaning room has been transformed into the "cleanest room" in the foundry.

Grinding One Side

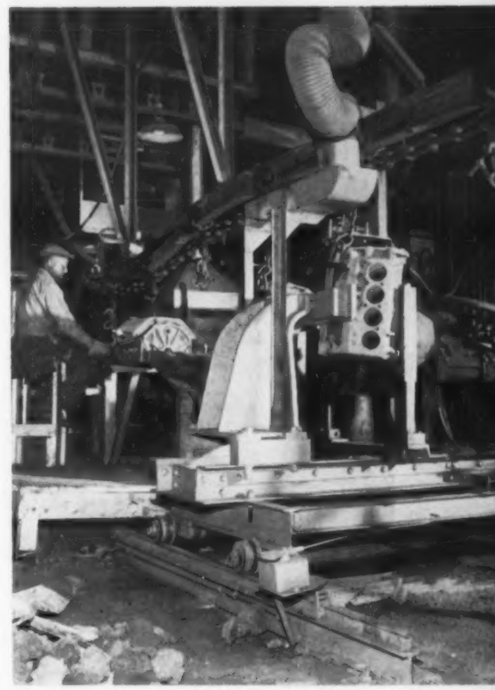
Let's follow a V-8 cylinder block on its journey through this "no-man-handling" department. The block reaches the cleaning department after shakeout and a two hour trip on an overhead cooling conveyor. Passing over a vibrating core knockout machine, the casting is fed into the No. 1 station on the mechanized cleaning line.

From this waiting station the block moves down inclined gravity rollers to the No. 2 station, which is a horizontal 16-in. diameter carborundum grinding wheel spinning at 1600 rpm. Dodge ingenuity resorted to the use of a bearing salvaged from an old shot blast machine to support this wheel driven by a 7½-hp electric motor. The wheel was made adjustable by use of a reworked bucket elevator "take-up" bearing.

When the block arrives at the wheel, it trips a lever that actuates a trolley driven by an air cylinder that slides the block across the grinding wheel in 10 seconds. The oil pan face of the block is ground smooth in this operation. A dust collector removes grindings at the source of generation.

Shuttle Bar

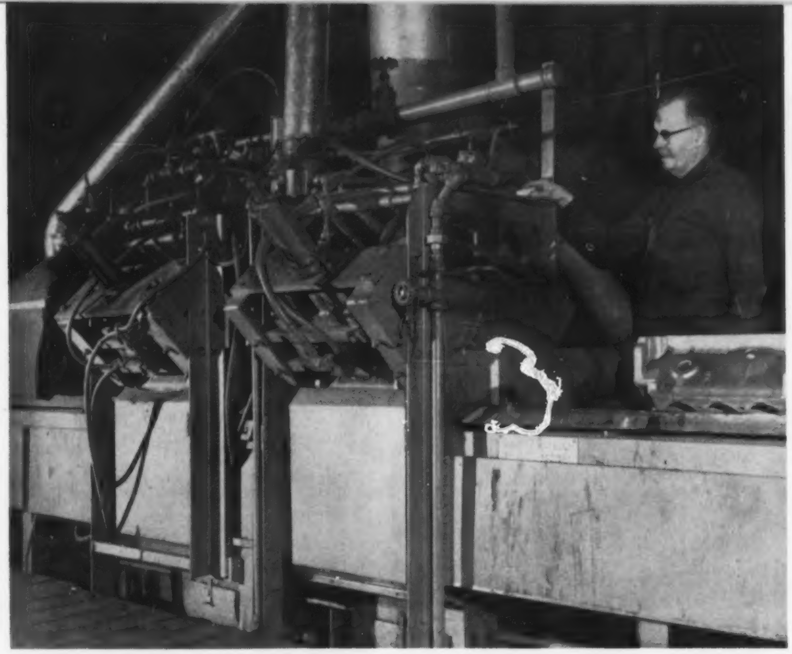
The block now rests on two straight steel rails (salvaged from an old craneway) and moves in a direction at right angles to its former travel. Space limitations required this directional change. Under this track is located a shuttle bar with six over-balanced "dogs"



Vibrating shakeout machine clamps block and removes the sand and metal from cored holes.

Eight hardened steel punches remove fins from the cylinder bores automatically in 10 seconds here.

Peter Petcoff watches the casting roll-over device flip block 180°.



After shot blast cleaning it is essential that all shot and grit be removed from blocks. Glenn McDaris adjusts air cleaner doing this job.

attached at intervals. The shuttle bar moves forward in a 38-in. stroke, bringing the dogs in contact with four cylinder blocks and pushing them along the track. When the shuttle returns, the dogs slide under blocks and spring up into position for the next pushing stroke.

Length of shuttle stroke is adjustable as is location of dogs on shuttle, thus allowing selective positioning (within limits) of each block. The shuttle moves forward in 5 seconds, returns and waits 10 seconds before the next forward stroke. This movement of block places it in the No. 3 station where it is locked in position.

Pneumatic Shearing

A pneumatic hammer with a 12-in. wide chisel moves up the front side of block, shearing off the fins. At the same time a punch descends vertically into the block and punches fins off four slots in top side of block. This operation, like the first one and all subsequent ones, requires only 10 seconds to perform. The hammer, incidentally, is just an old pneumatic one formerly operated by hand.

The shuttle bar moves the block forward to an idle station, No. 4, then into No. 5 station where another air hammer has been rigged with a long punching bar. This bar moves forward and punches fins from five holes for the camshaft bearings. Two small punches clean two water holes on the front of block.

The block is now pushed to idle station No. 6 where it is manually attached to a hook on an overhead chain conveyor. This conveyor carries it past a vibrating shakeout machine that automatically clamps the block between two faces and vibrates sand and metallics out of the cored holes. This machine is mounted on rails and is synchronized to move forward with the overhead conveyor during this operation and then return to await the next block. Sand and metal fall through a grate in the floor, and dust is sucked into a hood located just above the vibrator. Experimental work is underway to enclose this vibrating equipment for noise elimination.

The overhead conveyor carries the block to the other side of room where it is set down on a similar automatic shuttle bar type conveyor. At one of the idle stations a man hand punches three oil drain-back holes and another worker punches four. The block then moves into a machine which has eight hardened steel punches that clean the cylinder bores.

Shot Blast Problem

The casting is automatically rolled over 180 degrees and more hand cleaning operations are performed. The "home-made" roll-over device utilizes a sprocket chain attached to a sprocket wheel on one end and a lead weight on the other. Weight of the block starts the tipping action and a dead air cylinder slows the motion. The lead weight counterbalance returns tipping platform to the horizontal position.

Future plans call for installation of more mechanical equipment to perform these hand cleaning operations. A total of 34 openings in the block are eventually cleaned by machine and man.

Blocks are hooked onto an overhead conveyor that carries them into the blast cleaning room. Since most sand and fins are off the castings at this stage, cleaning has proven more efficient. Shot blasting costs have been estimated to be reduced as much as 50 per cent.

Castings come out of blast cleaning with considerable metallic shot trapped in the many holes and pockets required in a modern water-cooled cylinder block. In order to recover this re-usable shot and prevent it being present in the finished engine, great care is taken to clean the block.

The next 6-station mechanized cleaning unit is dedicated to this important task. At one station air is blown up from the bottom and at the next station air is blown down from the top side of the block. Several water opening holes are definned in this machine with hollow punches that are also used for air-blast cleaning. Castings are then inspected and touched up by hand where necessary.

The fourth and fifth units are used for further inspection and pressure testing for water leaks. At the end of this line the finished castings are hooked to an overhead conveyor which delivers them to the machine shop.

Rugged and Safe

Since this equipment was built by foundrymen to be used by foundrymen, it was built rugged and built to be operated continuously with a minimum of maintenance. For this reason all controls were made pneumatic. Two air cylinders supply all the power for each machine. Thus far, down-time for maintenance has been less than one per cent.

Safety has been designed into the installation so that any man working in any position on the cleaning line can pull a safety cable that will stop his unit immediately. At each station where an automatic operation is being performed, a small overhead hoist is located so that castings can be removed from the line if there is a breakdown ahead. Just to show you how Foreman Davis has provided for all eventualities, he has even designed the layout so that the machines can be pulled out or disconnected at any time. They can return to performing the cleaning operations with manual techniques.

The improved morale of the men working in this department and the professional pride of accomplishment instilled in the men who built the installation have been an added bonus for the Dodge foundry operation.

A MODERN CASTINGS

BONUS

This special report is the 24th in a monthly series presented by MODERN CASTINGS to analyze vital problems in the industry. In order to make copies available to foundries for their customers, a special quantity rate of five for $1 has been set for this guide to engineered castings.

Guide to ENGINEERED CASTINGS

Castings have many characteristics which make them desirable in the modern equipment used in transportation, construction, communication, power generation, agriculture, and in industry wherever metal shapes are needed in great quantity. The advantages of castings are partly related to the desirable properties of metals and alloys. Equally important, however, are the inherent advantages of the metal casting process as a truly basic means of shaping metals.

The designer may use one or any combination of metal-working processes for making a particular piece. Each of the processes and its product have merits and limitations. When castings and the casting process are selected as the preferred means of making a particular metal object, it should be on the basis of the peculiar advantages associated with them.

Castings are well suited to the needs of designers who wish to develop metal parts that have a suitable structural and functional shape, will withstand stresses or other service conditions, will have a desirable appearance, and an acceptable cost. They may be produced with only slight limitations on size, shape, and intricacy. Because of the nature of molds, a cast part may have almost any desired configuration, externally and internally. Due to the fluidity of molten metal, it can fill remote corners, thin sections, and follow most desired contours to form the required shape.

This Bonus Section will serve as an introduction to the principles of casting design and the properties of metals, and alloys. Both the design engineer and the foundryman will find this an easy-to-use reference.

Material in this Bonus Section has been extracted from the Fourth Edition of the CAST METALS HANDBOOK, published this month by the American Foundrymen's Society. In this book, the designer will find an all-inclusive study of cast metals and their applications.

Structural Design Recommendations

Make full use of casting advantages by applying basic principles of metal flow and cooling

Properties of cast alloys, like wrought alloys, are influenced by section thickness. Coarser grain size in heavier sections usually results in poorer properties. In general, the best practice is to use the minimum castable section thicknesses that will provide the necessary strength or weight. Fine grain size, produced by chill casting in metal molds, by inserting chills in sand molds, by designing with very thin sections, or by alloying treatments, may profoundly influence metal properties. The designer should be aware of the range of these effects through information usually obtainable from the foundryman.

Aside from the metallurgical considerations, the general structural recommendations for good casting design are related to specific characteristics of foundry processes and casting alloys.

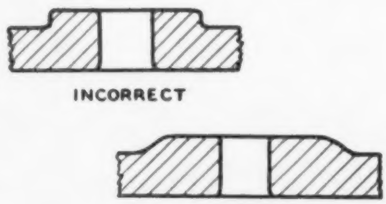


Fig. 1 . . Bosses, pads which add metal thickness in walls should be blended into body.

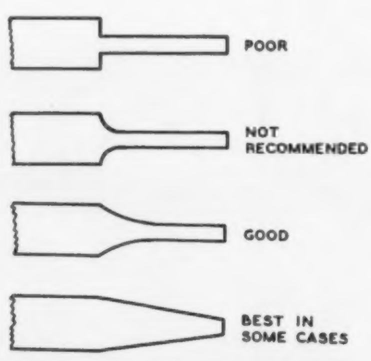


Fig. 2 . . Fillets & taper call for gradual section changes.

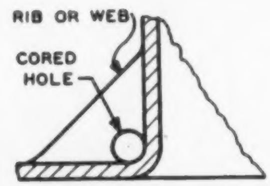


Fig. 3 . . Metal concentration should be minimized by cored openings in both web and ribs.

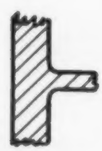


Fig. 4 . . Thin ribs should not join with heavier sections.

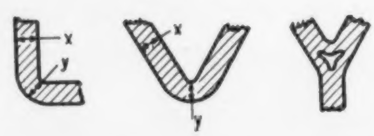


Fig. 5 . . In unfed L or V, radii should be provided at junction y to make section thinner than x. Y sections should have a triangular cored hole to reduce the thickness.

Section Proportioning

Whenever possible, section thickness throughout should be held as uniform as compatible with overall design considerations. If thickness must be varied, it should be changed gradually with fillets, as shown in Fig. 2. Where ribs are required, adequate fillets should be provided between them and the attached sections, as well as between adjoining sections. In general, ribs are best for resisting compressive stresses, plates for tensile stresses. It is important that thick sections not be isolated by thin sections in such a way that feeding of shrinkage in the thicker sections during solidification is difficult.

Good design should be aimed at reducing or eliminating hot spots and consequent danger of unsound metal. Hot spots develop where several sections join in such a way as to create a large volume of metal that cools more slowly than the surrounding parts of the casting. The succeeding sketches illustrate some of the pitfalls that are associated with hot spots, hot tearing, shrinkage, and uniform section proportioning to be avoided when designing castings in any metal composition. The foregoing recommendations have been made on a general basis for all alloys.

Minimum Section Thickness

If a casting section is too thin, it may not completely fill because the molten metal will freeze too quickly. Hard spots in gray iron, and property changes in other alloys may result if sections are too

thin. General recommendations for minimum sections for several casting processes are given in Table 1. Thin sections can only extend a certain limiting distance, depending on the casting alloy and casting process.

The minimum size of cored holes which can be cast depends greatly on the accuracy of core location, tolerance required and, of course, the casting process. In general, the figures listed in Table 2 may be used as a guide.

If a cored hole must be located with extreme accuracy, it is often desirable to drill it rather than core it. However, dimples may be put on the casting surface to locate the drill holes.

TABLE 1—GENERAL RECOMMENDATIONS—MINIMUM SECTIONS FOR CASTINGS

	Minimum Section Size, in.				
		Die Castings			
Metal	Sand Castings	Over Large Areas	Over Small Areas	Permanent Mold	Plaster Mold
Aluminum Alloys	1/8-3/16	0.075	0.045	1/8 over small areas	0.040 over small areas
Copper Alloys	3/32	0.100	0.060	1/8 over small areas	0.060 over small areas
Gray Irons*	1/8-1/4	....	....	3/16 over small areas	....
Lead Alloys		0.075	0.040	....	....
Magnesium Alloys	5/32	0.080	0.050	5/32-3/16	....
Malleable Iron	1/8	....	....	....	....
Steel	3/16	....	....	....	....
Tin Alloys		0.060	0.030	....	....
White Iron	1/8	....	....	....	....
Zinc Alloys		0.045	0.015	....	....

* While 1/8-in. sections can be readily poured, a heavier section is less susceptible to hard spots.

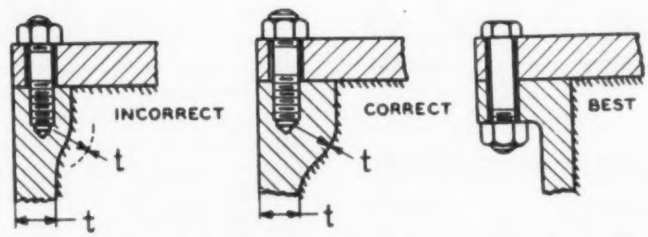


Fig. 6 . . Inserted stud will not restore the strength of the original thickness. Wall adjacent to drilled holes should equal main body.

Metal Costs

Of the cost factors encountered in producing castings, the cost of metal is one of the most important. Recognizing this fact, designers are prone to request minimum section thicknesses and close dimensional tolerances, both of which in many cases actually tend to raise costs. For each design of a cast part there is a fine balance between optimum section thickness (where minimum thickness is ample from a design viewpoint) and optimum cost. This results from the fact that many times a section thickness of 10 to 25 per cent greater than the minima quoted in the literature reduces rejects to a degree which more than compensate for the increased quantity of metal used.

Where weight reduction for functional reasons is the objective, the use of a lighter metal rather than difficult-to-cast thin sections frequently is the less expensive alternative.

The use of modern experimental stress analysis techniques results in efficient designs which conserve metal. The stress analyst is constantly looking for metal which does not pay its way, or which serves no useful function in design. Strangely enough, design changes indicated by stress analyses commonly are in the direction of improved castability. Experimental stress analysis is growing in use as a means of reducing casting costs by good design.

Metal loss is as real a cost as the metal shipped in the form of finished castings. Metal loss is the difference between metal purchased and metal shipped and represents process losses. Metal loss is directly related to weight efficiency, or the ratio of metal shipped to metal poured. The designer can reduce metal loss by making his designs readily castable. Good designs tend to reduce foundry rejects, which in turn reduce metal losses. High quality tools make possible a reduction of finish allowances, which in turn reduces metal losses.

Molding, Coring Simplification

Any changes in the casting design which make molding easier,

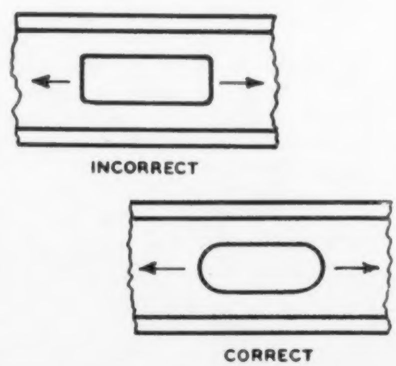


Fig. 7 . . Oval cored holes are best in webs and ribs.

Fig. 8 . . Eliminate undercuts from design when possible.

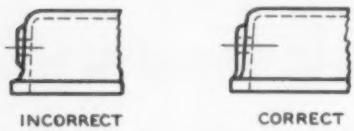


Fig. 9 . . Patterns having no draft complicate molding.

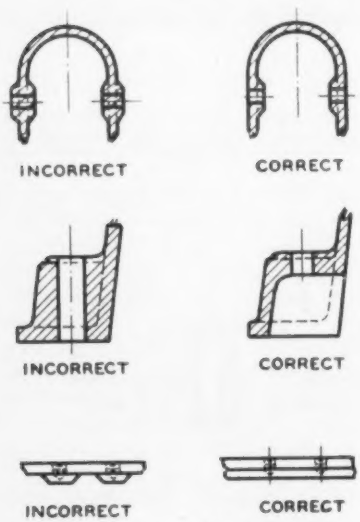


Fig. 10 . . Outside boss (top) should be eliminated to give pattern draft. Center design often saves machining, metal. Continuous rib design shown at bottom, rather than bosses permits shifting of holes.

less costly, or result in improved molds, help to make a better foundry practice. Some of the likely factors which are involved may be considered.

Pattern Drawing

Casting shapes that makes patterns more difficult to draw or molds more complex are to be avoided if possible. Undercuts or protruding bosses, flanges, etc., which are above or below the mold parting line, require the use of cores or loose pieces which might be eliminated with a better design. An example is given in Fig. 8. Deep pockets, especially if they are thin in section, are difficult to draw and should be avoided whenever possible.

The use of maximum draft on patterns, as in Fig. 15, improves drawing of pattern from mold. On many castings it is completely unnecessary to have vertical inner or outer surfaces and generous use of draft is possible. If the casting must have some deep pockets, they can be more easily molded if the pockets have generous draft. Inner portions of the casting which can be molded in green sand should have generous draft. Ordinarily draft is an allowance on the pattern. However, if the casting is designed with a minimum of vertical surfaces and good taper on side walls and ribs, then draft is not needed as an allowance on the pattern, but is actually built into the casting.

Any consideration of pattern-drawing difficulties must involve establishing the parting line on the castings, the latter being an important part of the pattern drawing problems. A flat parting surface is convenient and least liable to mold drops. Figure 16 illustrates casting redesign to make an uneven parting plane into a flat one. It is not necessarily true that a flat parting surface is always the most desirable. Some offset parting planes are necessary and may be desirable since they often permit bottom gating on some castings. However, the parting surface should be one that does not produce isolated, thin, or weak sand surfaces that may drop or be damaged during pattern drawing, mold handling, or metal pouring.

The foundryman is accustomed to searching for the best parting line on casting blueprints. However, the designer does not frequently enough consider the parting line problem. If the design cannot be simply parted in two halves that can be drawn from the mold, then it is necessary to use cores to help establish the parting. The latter is always a more costly process.

Elimination of Coring

Costs of mold construction with cores is generally greater than without them. Castings are not often originally designed with the elimination of coring in mind. However, redesign for greater economy may involve elimination or reduction of

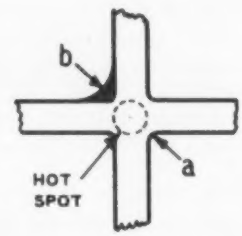


Fig. 11 . . Section crossing enlarges mass at **a** which retards cooling. Excessive fillet at **b** further slows the cooling rate of metal.

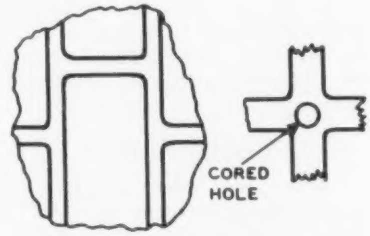


Fig. 12 . . Staggering ribs, webs, avoids concentration of metal. Coring of holes where ribs cross eliminates many problems of hot spots.

Fig. 13 . . Webs, ribs, from periphery is good design for use with flat plates.

TABLE 2—MINIMUM SIZE OF CORED HOLES

Sand Castings	D = ½ t; D = dia. core in in., usually not less than ¼-in., and t = section thickness in in.
Permanent Molds	D = ½ t, usually greater than 0.25-in. D.
Die Castings	
Copper Base	3/16-in. dia.
Aluminum Base	3/32-in. dia.
Zinc Base	1/32-in. dia.
Magnesium Base	3/32-in. dia.
Plaster Molds	Cores under ½-in dia. normally drilled.

coring in the mold. Figure 17 illustrates redesign to eliminate coring and, incidentally, retains a flat parting surface.

Cleaning problems are also generally reduced with a decrease in coring. Internal cores, small-long passages, and thin cores relative to the sections surrounding them often pose difficulties in cleaning. Sand burned into cored holes, and fins or veins are very difficult to remove when they are hard to reach. Access holes or clean-out holes are required.

Overall dimensional accuracy of a mold assembly may be improved by decreasing the number of cores required since the errors in core assemblies are additive.

Shape and Size

Compactness in design favors more economical molding practices. A casting which is unnecessarily long, or has portions which stick out considerably from the main body of the casting, requires large flasks and unduly limits the number of castings per mold. The compact design permits more castings per mold and requires less molding sand per casting.

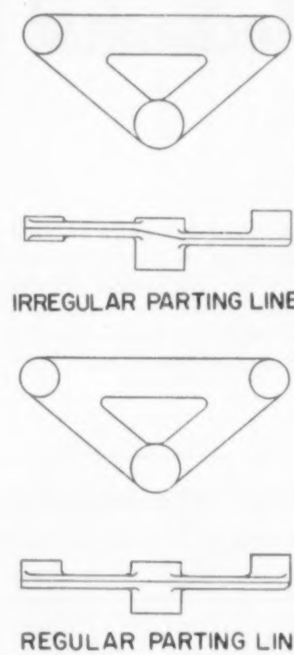


Fig. 16 . . Improved design to produce flat parting lines.

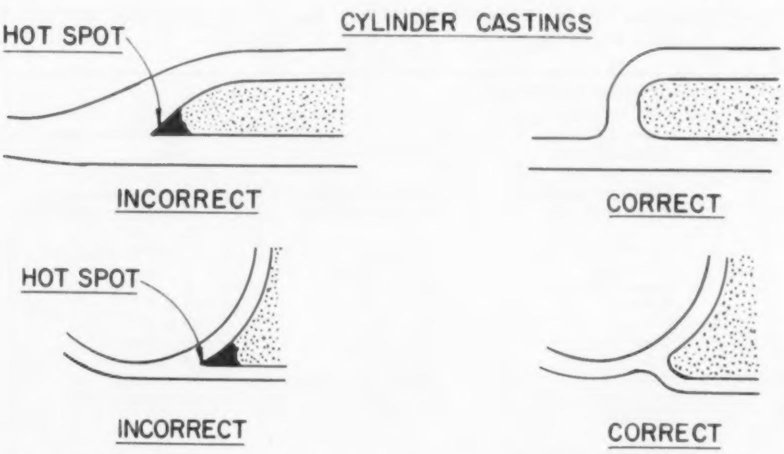
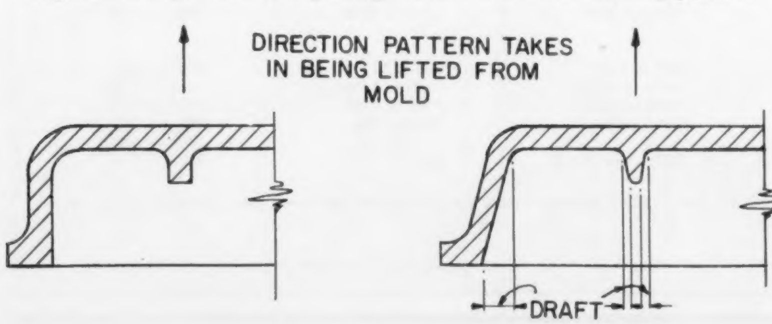


Fig. 14 . . Elimination of re-entrant angles shown in sketch aids in eliminating heat concentration and hot spots. (From O. W. Smalley)

Fig. 15 . . Improved casting design favors draft and drawing pattern.



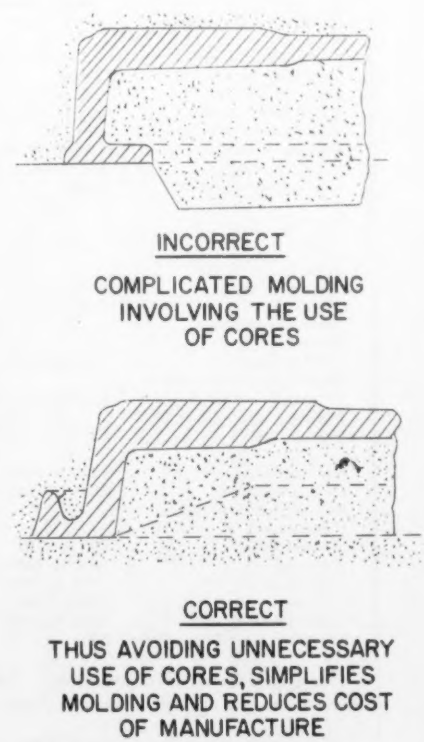


Fig. 17 . . Coring eliminated by re-design. (O. W. Smalley)

ENGINEERED CASTINGS

Mechanical Properties of Alloys

Design engineers will find that cast alloys have a wide range of properties to suit their needs

The following guide to selecting the right alloy to do the job has been purposely broadened. Families of alloys, such as gray iron, steel, aluminum-base, have been grouped to simplify the task of the design engineer. Instead of trying to choose one of the multitude of alloys in each family, it is preferable to select the alloy group with the range of properties that best encompass the requirement of the casting. Then rely on the judgment of the foundryman to select the specific alloy that will meet the design specifications as well as the characteristics necessary for castability.

Table 1—Mechanical and Physical Properties—Principal Types of Cast Ferrous Alloys

General information covering the range of properties of the ferrous casting alloys. Mechanical properties are for room temperature.

Property	Gray Iron	Ferritic & Pearlitic Malleable Iron	Nodular Iron	Carbon & Low Alloy Steel
MECHANICAL PROPERTIES				
Tensile Strength, psi	20,000 to 80,000	48,000 to 120,000 +	60,000 to 160,000 +	60,000 to 200,000 +
Tensile Yield Strength, psi	Essentially same as tensile strength	30,000 to 95,000	40,000 to 135,000	30,000 to 170,000 +
Compressive Strength, psi	3 to 5 × T.S.	About the same as in tension	About same as tensile yield strength	60,000 to 200,000
Shear Strength, psi	1.0 to 1.6 × T.S.	About 0.90 × T.S.	0.90 × T.S.	
Elongation in 2 in., %	3 to 0	26.0 to 1.0	26.0 to 1.0	35 to 5
Reduction of Area, %	0	23.0 to 0	30.0 to 0	65 to 5
Brinell Hardness No.	135 to 350 +	125 to 285 +	140 to 330 +	130 to 750[a]
Max. Rockwell C Hardness	60 to 64	60 to 64	60 to 64	65 to 66
Modulus of Elasticity, psi	12,000,000 to 22,000,000	25,000,000	24,000,000 to 26,000,000	30,000,000
Endurance Limit, psi	0.4 to 0.6 × T.S.	0.40 to 0.6 × T.S.	0.4 to 0.55 × T.S.	0.4 to 0.5 × T.S.
Impact Resistance, ft-lb	Low[b]	1 to 20.0	1 to 20.0	3 to 65
PHYSICAL PROPERTIES				
Density at 68 F				
grams/cu cm	6.95 to 7.35	7.15 to 7.60	7.15	7.81 to 7.86
lb/cu in.	0.25 to 0.266	0.258 to 0.274	0.25 to 0.28	0.282 to 0.284
Coefficient of Therm. Expansion				
10^{-6} in./in., F	5.8 (32 to 212 F)	6.6 (70 to 750 F)	7.5 (70 to 1100 F)	6.1 to 7.1 (32-212 C)
Thermal Conductivity at 68 F				
Btu/sq ft/sec/in./F	0.056 to 0.113	0.111 to 0.122		0.096 to 0.113
Electrical Resistivity at 68 F				
Microhm-cm	117.0 to 119.0	28.8 to 34.4	55 to 70	14 to 17 0.11 to 0.12 (20-100 C)
Melting Range, F	2000 to 2400	2000 to 2550	2000 to 2400	2600 to 2775
Casting Range, F	2200 to 2850	2550 to 2850	2200 to 2700	2850 to 3150
Normal Heat Treating Temperature, F				
Stress Relief	800 to 1250	800 to 1250	800 to 1250	800 to 1250
Anneal	1500 to 1800	1600 to 1750	1600 to 1750	1650 to 1700
Harden	1500 to 1700	1500 to 1650	1500 to 1700	1500 to 1650
Temper	350 to 1100	350 to 1200	350 to 1200	800 to 1350
Normalize	1500 to 1800			1600 to 1700
Max. Operating Temp., F	850	850	850	850

[a] Surface hardnesses up to 900 Vickers. [b] 20 to 80 ft-lb on 1.125-in. diameter round bars, unnotched, machined from halves of 1.20 diameter transverse bars and broken on 6-in supports.

Table 2–Mechanical and Physical Properties–Principal Types of Cast Nonferrous Alloys

General information covering the range of properties of the principal nonferrous casting alloys. Mechanical properties are for room temperature.

Property	Aluminum-Base Alloys	Copper-Base Alloys	Magnesium-Base Alloys	Nickel-Base Alloys: Cast Ni & Ni-Cu	Nickel-Base Alloys: Other Ni Alloys	Zinc-Base Alloys
MECHANICAL PROPERTIES						
Tensile Strength, psi	19,000 to 58,000	21,000-125,000	22,000-45,000	50,000-145,000	68,000-118,000	25,000-52,100
Tensile Yield Strength,[a] psi	8,000 to 43,000	11,000-100,000[b]	11,000-30,000	25,000-115,000	40,000-118,000	
Compressive Yield Strength,[a] psi	About same as tensile yield strength	8,000-60,000[c]	Same as tensile yield strength	18,000-80,000[d]		55,000-93,000
Shear Strength, psi	14,000 to 36,000		14,000-21,000			31,000-46,000
Elongation in 2 in., %	22 to 0	52-0	12-1	45-1	30-0	10-0.5
Reduction of Area, %		40-4		35-1	47-0	
Brinell Hardness[e]	40 to 140	47-425	45-84	100-375[e]	155-390[e]	75-100[f]
Rockwell E Hardness			60-90			
Modulus of Elasticity, psi	10,300,000	9,100,000-20,000,000	6,500,000	21,500,000-24,000,000	22,500,000-28,000,000	
Endurance Limit, psi	6,500 to 23,000	4,000-15,000 (?)	9,000-13,000[j]			6,875-8,500
Impact Resistance, ft-lb						
Charpy Unnotched bar	½ to 35[g]					1-48[g]
Charpy Keyhole Notched bar	0 to 8[i]		0.5-10	4-70	3-60[h]	
Izod Bar		½-40		3-80	25-85[h]	
PHYSICAL PROPERTIES						
Density at 68 F						
grams/cu cm	2.57 to 2.95	7.3 to 9.5	1.79 to 1.83	8.34 to 8.63	7.80 to 9.24	6.6 to 6.7
lb/cu ft	0.093 to 0.107	0.264 to 0.343	0.065 to 0.067	0.301 to 0.312	0.282 to 0.334	0.238 to 0.242
Coef. of Therm. Expansion,						
10^6 in./in./C	21.0 to 27.0[k]	10.9 to 18.0[l]	26.0[m]	12.0 to 13.0[m]	10 to 14[m]	27.4 to 27.7[m]
10^6 in./in./F	11.6 to 15.0[k]	9.0 to 12.0[l]	14.5[m]	6.8 to 7.4[m]	5.6 to 7.7[m]	15.1 to 15.4
Thermal Conductivity @ 68 F						
Gram-cal/sq cm/sec/cm/C	0.21 to 0.40	0.066 to 0.142[n]	0.16 to 0.27	0.062 to 0.142	0.027 to 0.050	0.25 to 0.27
Btu/sq ft/sec/in./F	0.168 to 0.32	0.053 to 0.114[n]	0.130 to 0.218	0.051 to 0.118	0.022 to 0.040	0.20 to 0.22
Electrical Conductivity, % of I.A.C.S.[t]	21 to 44	5 to 85	10 to 24	4 to 16	1.3 to 1.7	25 to 27
Elec Resistivity @ 68 F Microhm-cm	3.918 to 8.210	1.97 to 33.5[o]	5.9 to 17.0	21 to 63	100 to 135	6.369 to 6.849
Temperature Coefficient of Resistivity						
ohms/C					0 to 17 × 10^{-5} (20-500 C)	352.7 to 377.4 × 10^{-5} (0 to 100 C)
ohms/F					0 to 9.4 × 10^{-5} (68-932 F)	196 to 209.5 × 10^{-5} (32 to 212 F)
Specific Heat at 212 F[p]						
cal/gram/C or Btu/lb/F	0.23	0.12	0.23 to 0.25	0.11 to 0.13	0.09 to 0.136	0.10
Melting Range, F	1200 to 1500	1675 to 1930[q]	830 to 1190	2400 to 2600	2500 to 2825	727 to 932
Casting Range, F	1175 to 1475	1750 to 2350	1200 to 1550	2700 to 2900	2775 to 2950	740 to 800
Max. Liquidus Temperature, F	1195	see melting range	1190	2600	2550	743
Min. Solidus Temperature, F	840[q]		830	2300	2030	715
Heat Treating Temperature, F						
Stress relief	650[t]		500			
Solution heat treatment[s]	940 to 1000	1600 to 1650	730 to 1050	1600	1200 to 2150	
Aging treatment	310 to 500	1000 to 1200	335 to 600	1100		167 to 212

[a] 0.2% offset
[b] 0.5% extension under load
[c] Permanent set at 0.001 in./in. on a 10-mm ball
[d] Few data available; compressive yield strength
[e] 10-mm ball; 500-Kg load, except nickel alloys tested with 3000-Kg load
[f] Load held 30 sec
[g] ¼-in. square cast bar
[h] Data not available for all alloys; some have low impact resistance
[i] V-notch, ¼-in. square cast bar
[j] Based on 500,000,000 cycles on R. R. Moore type machine and specimen
[k] 68 to 572° F (20 to 300° C)
[l] 68 to 1652° F (20 to 900° C)
[m] 68 to 212° F (20 to 100° C)
[n] 7 to 15% that of copper
[o] Calculated from conductivity values
[p] Also numerically the same in Btu/lb/°F
[q] Approximate melting point
[s] Also an annealing treatment; type of alloy and cooling rate determines whether or not alloy is hardened or softened at room temperature
[t] Per cent of conductivity compared to International Annealed Copper Standard.

Table 3—Other Properties of Ferrous and Non-Ferrous Alloys—Relative

Property	Gray Cast Iron	Malleable & Pearlitic Malleable Iron	Nodular Iron	Carbon & Low Alloy Steel	Aluminum-Base Alloys	Copper-Base Alloys	Magnesium-Base Alloys	Nickel-Base Alloys	Zinc-Base Alloys
Machinability[a]	Good (3.5)	Good	Good	Less machinable than other ferrous alloys (6.5)	Good to excellent (1.8)	Fair to good (2.3 for leaded yellow brass)	Excellent (1.0)	Comparable to steel	Excellent
Damping Capacity	Approx. 10X that of steel	Roughly related inversely to the modulus of elasticity							
Wear Resistance, lubricated sliding friction	Excellent	Pearlitic—excellent; Malleable—good	Good to excellent	Good; improved by heat treatment	Poor to excellent	Good to excellent	Poor to excellent	Probably comparable to steel	Poor
Suitability as a bearing material[b]	Poor to excellent	Pearlitic—poor to excellent; Malleable—poor	Poor to excellent	Inferior to cast iron	Poor except for special bearing alloy	Good to excellent	Poor	Not normally used as a bearing	Poor
Abrasive wear[c]	Excellent for special alloys	Pearlitic Malleable[c]	Pearlitic nodular[c]	Excellent for special alloys	Poor	Poor to good depending on hardness	Poor	Poor to good	Poor
	Depends on hardness						Depends on hardness		
Notch sensitivity[d]	Ferrous alloys fairly comparable on basis of unnotched to notched bar in fatigue test. Cast steel less sensitive than wrought steel				Yes	Few data available	Few data available		
Section sensitiviey[e]	Yes	No	As-cast—Yes Annealed—No	To a limited extent	Yes	To a limited extent	To a limited extent	To a limited extent	No, when used in die casting
Suitability for joining by:									
Brazing	Yes	Yes	Yes	Yes	Yes, for a few alloys	Yes	No[f]	Yes	No[f]
Soldering	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Welding	Yes, with special precaution			Yes, with ease[g]	Yes[h]	Yes	Yes	Yes	Yes
Fluidity	Excellent	Good	Excellent	Inferior to cast iron	Excellent	Fair to good	Good to excellent	Comparable to steel	Exxcellent
Susceptibility to hot tearing	No	Yes	No	Yes	Depends on composition	Depends on composition	Depends on Composition	Comparable to steel	No
Pressure tightness	Yes	Yes	Yes	Yes	Depends on composition	Depends on composition	Depends on composition	Yes	Yes
Properties altered by heat treatment	Yes	Yes; 100% heat treated	Yes	Yes	Yes, for most alloys	In a few alloys	Yes, for most alloys	In a few alloys	No, except dimensional stability
Subject to Property Control through inocula tion, Ladle Treatment, etc.	Yes	Mildly so	Treatment a necessity	Mildly so	For a few alloys	Mildly so	Yes	No	No

[a] Figures give relative power requirements to machine.

[b] Excellence as a bearing alloy, among other things, requires proper metal structure; for instance, ferrite as a constituent in ferrous castings is generally avoided. In cast irons, proper size and distribution of the graphite flakes is also important.

[c] Good abrasion resistance in ferrous alloys can also be obtained by surface hardening treatments.

[d] Limited data do not justify a more critical comparison.

[e] Variation in properties of a casting depending on section size or cooling rate.

[f] Low melting points of these alloys precludes use of this method.

[g] Up to 0.35% C.

[h] Preparation of surface and selection of welding rod and flux important.

Meeting Special Service Conditions

Corrosion, unusual temperature ranges, and other service problems can be solved through the use of the versatile cast metals and alloys

Effect of Temperature

▪ **Gray iron.** Up to temperatures of 600 to 750 F, the mechanical properties of fine-grained, dense irons used in well-designed castings are not impaired. Subnormal temperatures do not appear to seriously impair the properties of gray iron. At temperatures of -112 and below there is a slight decrease in impact value.

▪ **Malleable iron.** Retains normal tensile strength to about 800 F, but strength decreases rapidly above 800 F, until at 1200 F it has only 1/4 to 1/5 normal strength.

▪ **Steel.** Temperatures above about 500 F lower the strength and hardness of steel castings, and increase their ductility. Carbon steel castings are suitable for applications of 900 to 1000 F. High chromium-nickel alloys are available for temperatures above 1100 F. Subnormal temperatures induce brittleness in steel castings, but carbon steel, containing less than 0.18 per cent carbon, is available for low temperature applications.

▪ **Aluminum.** Alloys containing 10 per cent copper-magnesium or four per cent copper-nickel-magnesium best retain mechanical properties at elevated temperatures.

▪ **Copper-base alloys.** Some bronzes may be used at temperatures to 900 F.

▪ **Magnesium-base alloys.** Magnesium-aluminum-zinc and magnesium-zinc-zirconium alloys are used where temperatures range below 250 F. Alloys containing rare earths and zirconium, with and without zinc, may be used to 500-550 F. Alloys containing thorium, with and without zinc, may be used to about 650 F.

▪ **Titanium-base alloys.** Retain mechanical properties to 700 F.

▪ **Zinc-base alloys.** Alloy No. 3 is suitable for elevated temperature applications, but the mechanical properties of most zinc alloys deteriorate at elevated temperatures.

▪ **Nodular iron.** Retains mechanical properties at elevated temperatures to 800 F.

Corrosion Resistance

▪ **Gray iron.** Gray iron has good resistance to most alkaline solutions, to many organic compounds and to neutral and very slightly acid solutions. Most intermediate and dilute solutions of common mineral acids seriously corrode iron.

▪ **Malleable iron.** Excellent corrosion resistance in many applications. A metallurgical condition resulting from the anneal contributes to the corrosion resistance of malleable castings. Malleable iron can be galvanized for added protection.

▪ **Nodular iron.** Has substantially the same resistance as gray iron. Good resistance to atmospheric corrosion.

▪ **Steel.** The corrosion resistance of steel is similar to that of iron, but steel is likely to differ in behavior against neutral solutions. In neutral solutions steel may be corroded more severely than iron. For many highly corrosive applications, stainless steel may be employed.

▪ **Aluminum.** Aluminum-magnesium alloys have excellent resistance to some types of corrosion.

▪ **Copper-base alloys.** Frequently used because of excellent corrosion resistance. The various alloys resist a wide range of corrosive materials.

▪ **Magnesium-base alloys.** Resistance to corrosion now improved by new alloys and casting techniques.

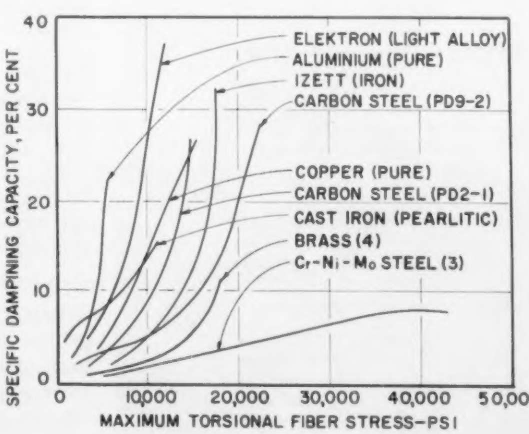
▪ **Nickel-base alloys.** Good corrosion resistance. Monel type alloys resist most mineral acids, most organic acids, and all alkalies.

▪ **Titanium-base alloys.** Excellent resistance to many corrosive media.

▪ **Zinc-base alloys.** Not recommended for castings continuously exposed to steam, salt water, or alkalies.

Vibration Damping Capacity

The effective strength of a vibrating part may be much greater if it is made from a material with a high damping capacity. The relative damping capacity of a series of metals with high damping capacity is indicated by the following chart:



Damping capacities of a series of metals with relatively high damping capacity are illustrated by curves.

Casting Applications

Cast Metals . . . And Their Typical Uses

Metal	Typical Uses
Gray Iron Known for its low cost of production in large quantities, ease of casting, excellent machinability, good wear resistance, high damping capacity, low shrinkage, high compressive strength.	Automotive cylinder blocks and heads, crankcases, clutch plates, flywheels, pistons, piston rings, exhaust manifolds, camshafts, crankshafts, brake drums; railroad car wheels, brake shoes, cylinders, pistons; pipe and fittings, machine tool beds and bases, hardware, radiators and stove parts; bathtubs, wash basins, and bowls; wheels, gears, sprockets, pulleys, plowshares and points, rolling mill rolls and ingot molds, manhole covers, fireplugs, lamp posts, mail boxes.
Malleable Iron A low cost material used primarily in mass production of relatively small cast parts with limited cross-section.	Differential carriers, gear cases, bearing caps, steering gear housings, truck spring hangers, hubs, rocker arms, universal yokes; railroad brake heads, fulcrums and hand brake wheels.
Nodular Iron Develops properties similar to pearlitic malleable iron with little or no heat treat.	Crankshafts, gears, hydraulic machinery parts, miscellaneous automobile, truck and tractor parts, machine tool castings, forging hammer parts, and castings for mining industry.
Steel Meet the most severe service requirements because of their broad range of high strength, ductility, modulus, hardenability, corrosion resistance, and elevated temperature properties.	Automotive cross members, frames, gears, housings, pinions, spring carriers, wheels; engine bases, crossheads, cylinder blocks and heads; railroad side frames, truck frames, bolsters, yokes, couplings, wheels, brake shoes; marine chain, bolts, compressors, hardware, pipe and fittings, rudders; anvils, dies, shafts, turbine wheels, annealing boxes, rolling mill rolls.
Aluminum-base Alloys Combine good strength, light weight, machineability, superior corrosion resistance, high thermal and electrical conductivity, and ease of applying surface finishes.	Automotive axle housings, crankcases, bearing caps, pistons, cylinder heads, manifolds, brake pistons, ornamental grills, transmission parts, torque converter blades; aircraft wheels, fittings, housings, engine and pump parts; cooking utensils, chemical resistant and marine hardware, typewriter frames, instrument cases, brackets, frames, levers, cover plates, household appliance parts.
Copper-base Alloys Tops in electrical and thermal conductivity, superior in many corrosive enviroments, and have a beautiful surface.	Bearings, gears, bells, pumps, impellers, piston rings, plumbing hardware, fittings, carburetors, statuary and ornamental fixtures, marine fittings, hardware and propellers, meter parts, paper machinery, locks, medallions, non-sparking tools, valves, valve stems, rocker arms, dairy equipment.
Magnesium-base Alloys Used in applications requiring the lightest weight, high strength-weight ratio, machinability, and stability.	Aircraft accessory control mechanisms, landing wheels, engine parts, housings and airframe members; chain saw and other portable tool parts, textile mill and loom parts, foundry flasks, parts for transportation and materials handling equipment.
Nickel-base Alloys Have outstanding corrosion and high temperature resistance, and surface finish.	Corrosion resistant castings in the chemical, textile, paper, oil, food processing, and pharmaceutical industries; marine, household and archetectural castings; pumps, fittings, and valves for corrosive media.
Zinc-base Alloys Used primarily for die casting and slush casting because of their low melting point, high fluidity, low cost, and dimensional accuracy.	Automotive parts for carburetors, fuel pumps, horns, heaters, and grilles, hubs, brackets, hardware and molding; parts for washing machines, motors, vacuum cleaners, clocks, kitchen equipment; parts for typewriters, recorders, cameras, vending machines, cash registers, mixers; portable and machine tools; hardware and toys.

Producing the Casting

A variety of casting processes are available to the design engineer when selecting a foundry

The designer has available to him a variety of casting processes, each of which has its advantages and limitations. For a given quantity of a specified component there is usually one casting process that will do the job best for the least expense. However, this optimum process will not necessarily be the one which produces the lowest rough casting price, but rather the method by which the total finished cost of the part is minimized.

Total part cost includes the tooling cost pro-rated over the number of pieces to be cast, rough casting cost, machining costs, finishing costs, and assembly costs. These cost elements are controllable to varying degrees by the designer.

The designer determines the casting process to be used by reference to his knowledge of the casting processes, by consultation with his casting sources, and by studies of foundry literature. All casting processes co-exist because they are competitive in the market as a whole but for each specific job one may prove itself superior.

The various basic casting processes available to the design engineer are pictured in this section of the Guide to Engineered Castings. The captions adjacent to the photos describe briefly the fundamental operations and equipment used in making castings by each process.

One other casting technique receiving wide spread industrial use should be mentioned. Symmetrical shapes such as pipes, piston rings, and cylinder liners are often centrifugal cast using either sand or permanent molds. In the manufacture of cast iron pipe cylindrical shaped mold is spun about its longitudinal axis which has a slight down-hill slope. Molten iron is introduced at the high end and centrifugal force distributes it uniformly about the periphery of the mold over its entire length. The measured weight of metal poured into the mold determines the wall thickness of pipe. The metal quickly solidifies and is removed from the mold.

As a guide in selecting the casting process the following tables have been prepared so the design engineer can compare the relative merits of the various ones available.

TYPICAL CASTINGS BEING PRODUCED BY THE VARIOUS FOUNDRY PROCESSES

Green and Dry Sand (Ferrous and Non-ferrous)	Gears, housings, motor blocks, crankshafts, machine tool frames and beds, propellers, manifolds, brake shoes, railroad car wheels, ingot molds, pipe, flywheels, rolling mill rolls, pump components.
Shell Molding (Ferrous and Non-ferrous)	Crankshafts, camshafts, gears, plumbing valves, hardware and fittings, small aircraft components.
Plaster Molding (Non-ferrous)	Torque converters, complicated copper-base parts, machine parts, aircraft components, matchplate patterns.
Investment Casting (Ferrous and Non-ferrous)	Jet engine parts, turbine components, wave guides, gears, brackets, prosthetic castings, dentures, small machine and ordnance parts.
Permanent Mold (Ferrous and Non-ferrous)	Shock absorber components, carburetor bodies, small gears, pistons, cylinder heads, grinding balls, pipe, piston rings, cylinder liner.
Die Casting (Non-ferrous)	Structural and decorative parts for automotive, household appliance, business machine, and all other high-production industries.

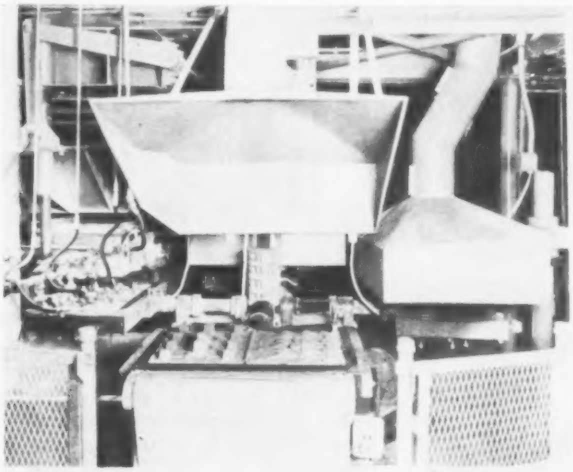
Green sand mold made with molding machine using match plate. This technique requires: 1) wood, metal, or plastic pattern or match-plate to form one half of mold cavity, 2) flask which is set on pattern plate and filled with molding sand, 3) machine to jolt or squeeze sand compactly about pattern, 4) pattern is withdrawn from sand mold, 5) internal holes or cavities are formed by placing hardened sand cores in mold, 6) the two mold halves are closed and molten metal is poured in.

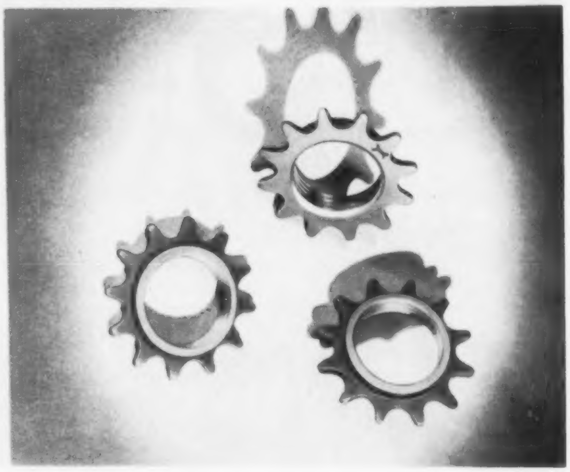
Table 1—Summary of Molding and Casting Process Characteristics

Process	Green Sand	Dry Sand	Floor and Pit Molding	Shell Molding	Plaster Molding	Investment Casting	Permanent Mold	Die Casting
Number of Castings Minimum	One	One	One	500 or more	One or more.	500 to 5000	1000 to 5000	1000 to 5000 or more.
Maximum	Pattern life limited	Core box life limited	Pattern life limited	Pattern life limited	Limited to pattern life.	Limited to pattern life.	Mold life limited 1000 to 100,000	Mold life limited 5000 to several hundred thousand.
Type of Patterns	Simple wood patterns, plastic, or machined metal patterns and core boxes.	Core boxes and driers.	Usually wood patterns.	Machined, metal patterns and core boxes.	Metal patterns machined to accuracy of 0.003 in. or less and then polished; also plastic.	Metal die, for casting wax patterns.	Machined Mold.	Machined mold.
Casting Size Casting Alloys*	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.	1, 3, 4, 5, 6, 7, 8, 9.	1, 2, 3, 4, 5, 6, 8, 9.	4, 5, 7, 8, 10, 11.	1, 3, 4, 5, 6, 7, 8, 9.	1, 4, 5, 6, 7, 8, 10, 11.	4, 5, 7, 8, 10, 11.
(weight)	One oz to several tons.	One oz to several hundred lb.	Large, any weight.	One oz to several hundred lb. Shell usually small, under 25 lb.	Less than 1 oz to several hundred lb., usually under 15 lb.	Less than one oz to several hundred lb., usually under 10 lb.	Several oz to about 50 lb.; sometimes up to about 500 lb.	Several oz to about 35 lb., usually under 10 lb.
Casting Intricacy External-mold surface	Green sand limited by pattern drawing;[1] no limit with cores.	No limit	No limit with cores.	Limited by pattern drawing; no limit with cores.	Limited by pattern drawing.	No limit.	Limited by casting ejection.	Limited by casting ejection.
Internal-cored surfaces	No limit.	No limit.	No limit.	No limit.	No limit.	No limit.	Simple with metal cores, no limit with sand cores.	Simple, limited by metal cores.

*1. Gray Iron
2. Malleable Iron
3. Steel
4. Aluminum Alloys
5. Copper Alloys
6. Nickel Alloys
7. Zinc Alloys
8. Magnesium Alloys
9. Heat and Corrosion Resistant Alloys
10. Tin Alloys
11. Lead Alloys

[1] Pattern drawing refers to ability of drawing pattern from mold. Geometry of pattern must be such that it has no under cuts or back-draft that would prevent its being removed from mold without damage to mold.

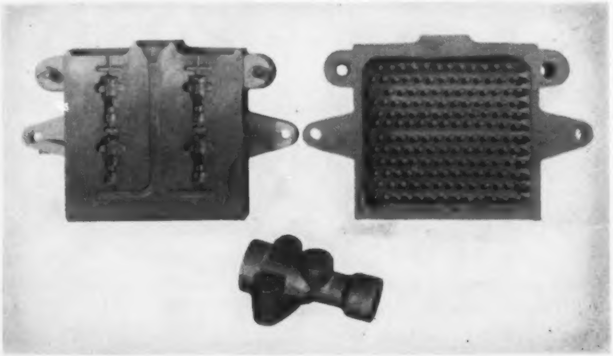




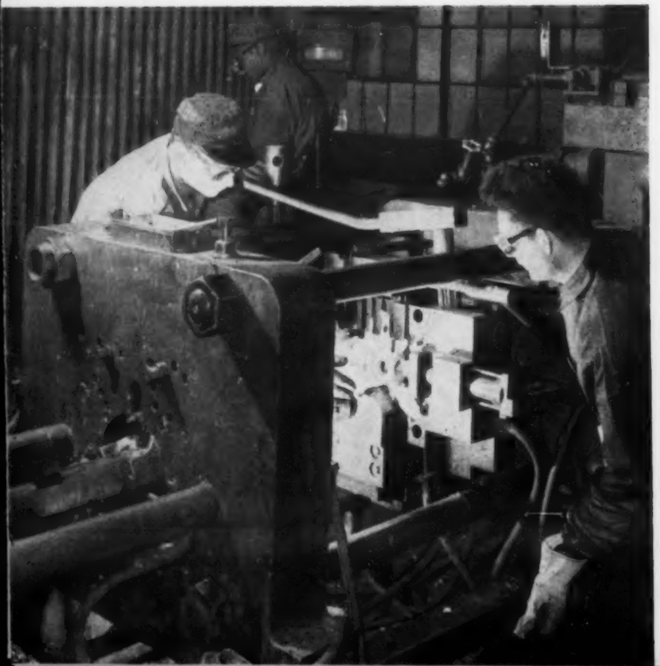
Small parts made by shell molding. This technique requires: 1) metal pattern plate, heated over 400 F, 2) sand and phenolic resin dumped on the hot plate, 3) heat causes layer or shell of mix to build-up on plate, 4) balance of mix falls away from plate when rotated 180 deg, 5) plate and shell placed in oven for quick shell cure, 6) cured shell is ejected from plate, 7) two mold halves are joined.

Hydraulic transmission castings made in plaster molds. This technique requires: 1) pattern plate and water proof flask, 2) slurry of casting plaster poured over pattern, 3) plaster slurry sets hard in 15 min. and pattern and flash removed, 4) mold is oven dried.

Variety of small intricate cast parts made by the investment casting process. This technique requires: 1) a multi-piece metal die into which molten wax or plastic is injected to make replicas of the part to be cast, 2) a number of the replicas are attached to a wax or plastic gating system, 3) the cluster is invested in a refractory material, 4) the wax or plastic is melted and burned out of the investment, and 5) molten metal is poured into the mold cavity to produce the castings.



Front and back view of one half of two piece 4-cavity permanent mold for producing gray iron castings shown in foreground. This technique requires: 1) machined metal mold, 2) opening and closing mechanism, 3) refractory spray coating on mold cavity surfaces, and 4) metal poured into sprue opening on top of mold.



Die casting being removed from die casting machine. This technique requires: 1) a chamber to hold molten metal, 2) multi-piece metal die which is opened and closed mechanically, 3) a plunger which forces the molten metal into the die under great pressure, 4) ejection pins to free the casting from the die when the die is opened after the metal has solidified.

Table 2–Effect of Molding Method on Dimensional Characteristics of Castings

	Green Sand, General	Green Sand, Optimum	Dry Sand	Shell Molding	Plaster Molding	Investment Casting	Permanent Mold	Die Casting
Section Thickness, in. Minimum	3/16 in.—Al alloys 3/32 in.—Cu alloys 1/8 in.—gray irons 1/8 in.—malleable irons	Same as green sand	Same as green sand	Less than green sand	0.040 to 0.060 in. depending on surface area of section	0.025 to 0.050 in. depending on surface area of section	3/16-in. gray iron 3/32-1/8-in.-Cu, Al 5/32-in.-Mg	0.031-0.062 in—Cu alloys 0.040-0.080 in.—Al alloys 0.031-0.062 in.—Mg alloys 0.015-0.050 in.—Zn alloys
Maximum	1/4 to 1/2 in.—steel 5/32 in.—Mg alloys No limit in floor or pit molds	———	———	———	———	Normally 0.500 in., may be more in some cases	2.0 in.	5/16 in. satisfactory normally less than 0.050 in.
Minimum Cored Hole, Diameter, in.	1/4-in.	3/16-in.	3/16 to 1/4-in.	1/8 to 1/4-in.	0.500 in.	0.020 to 0.050 in.	3/16 to 1/4-in.	3/16-in.—Cu alloys 3/32-in.—Al alloys 3/32-in.—Mg alloys 1/32-in.—Zn alloys
Tolerances, plus or minus average	1/32 in./ft—Al alloys 3/32 in./ft—Cu alloys 3/64 in./ft—gray irons 1/32 in./ft malleable irons 1/16 in./ft—steel 1/32 in./ft—Mg alloys	0.005 in./in. as little as 0.005 in. total on some casting dimensions	Similar to or better than green sand	0.005 in./in. as little as 0.003 in. total on some dimensions	0.005 in./in. or less	Minimum 0.002 in./in. for non-ferrous alloys, 0.004 in./in. for ferrous alloys, average of 0.005 in./in. on dimensions over one inch.	0.015 in./in. for first in. Add 0.001 to 0.002 for each additional in. May be reduced to ± 0.010 in. total in some castings.	0.003 in./in.; 0.005 in. min Cu alloys 0.0015 in./in.; 0.00 in. min Al alloys 0.0015 in./in.; 0.002 in. min Mg alloys 0.001 in./in.; 0.0025 in. min Zn alloys
across parting line	Included in above values	Add 0.010 in. to above	———	Add 0.005 to 0.015 in. to above	Add 0.010 in. to above or total of 0.010 in./in.	Add 0.001 in/in. to above	Add 0.010 to 0.020 to above	Add 0.003 to 0.010 in. to above
Surface finish, Micro-inches, RMS	250-1000 RMS	100-250 RMS	Somewhat better than green sand	50 to 250 RMS	30 to 50 RMS	10 to 85 RMS	100 to 250 RMS	40 to 100 RMS

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* Now MODERN CASTINGS

This is the final installment in a series of four articles describing means for reducing the cost of foundry grinding operations. The first two articles covered snagging operations, while the third and fourth articles discuss cut-off.

Cost Cutting with Grinding Wheels: Part 4

CUT-OFF WHEEL SELECTION

John A. Mueller /
The Carborundum Company
Niagara Falls, N. Y.

Small changes in grit, grade, or thickness of cut-off wheels can make or break the economy of this vital foundry operation

A small change in the grit, thickness, or grade of a cut-off wheel may result in great or small changes in cutting efficiency, but most often the results will again prove that a little study by the foundryman can produce great economies in the use of abrasive wheels.

The effect of the conditions under which a cut-off wheel is operated on the economy of the operation have already been discussed. Now, the abrasive cut-off wheel itself and effect it has on the cut-off operation will be considered.

Grit Size

Grit size provides a method of varying the performance of a cut-off wheel to adapt it to the requirements of a specific operation. In normal cut-off operations, grit sizes range from coarse 24 grit to fine 120 grit. How much change in wheel performance can be effected by a change in grit size is shown in Fig. 1. This graph shows that the coarser grit wheel produced the highest cutting efficiency and that when the grit size became finer the efficiency decreased.

A change from 24 to 30 grit reduced cutting efficiency 45 per cent. Changing from 30 to 36 grit affected the cutting efficiency very little. However, a change from 36 grit to 54 grit produced a 31 per cent drop in cutting efficiency and a further decrease of 40 per cent occurred when the grit size was changed to 60 grit.

In terms of cutting efficiency, size can change cutting efficiency as much as 80 per cent. If long life is desired, coarse grit wheels are the proper wheels to use. Fig. 2 shows the quality of cut produced with various grit size wheels when cutting solid bar stock. This graph demonstrates that the coarse grit wheels produced a quality of cut that is inferior to the finer grits. As the grit size becomes finer, the quality of cut improves.

EXCELLENT

A fast cut with a fine grit wheel produced this sample which has only the slight burr and shows no burning.

GOOD

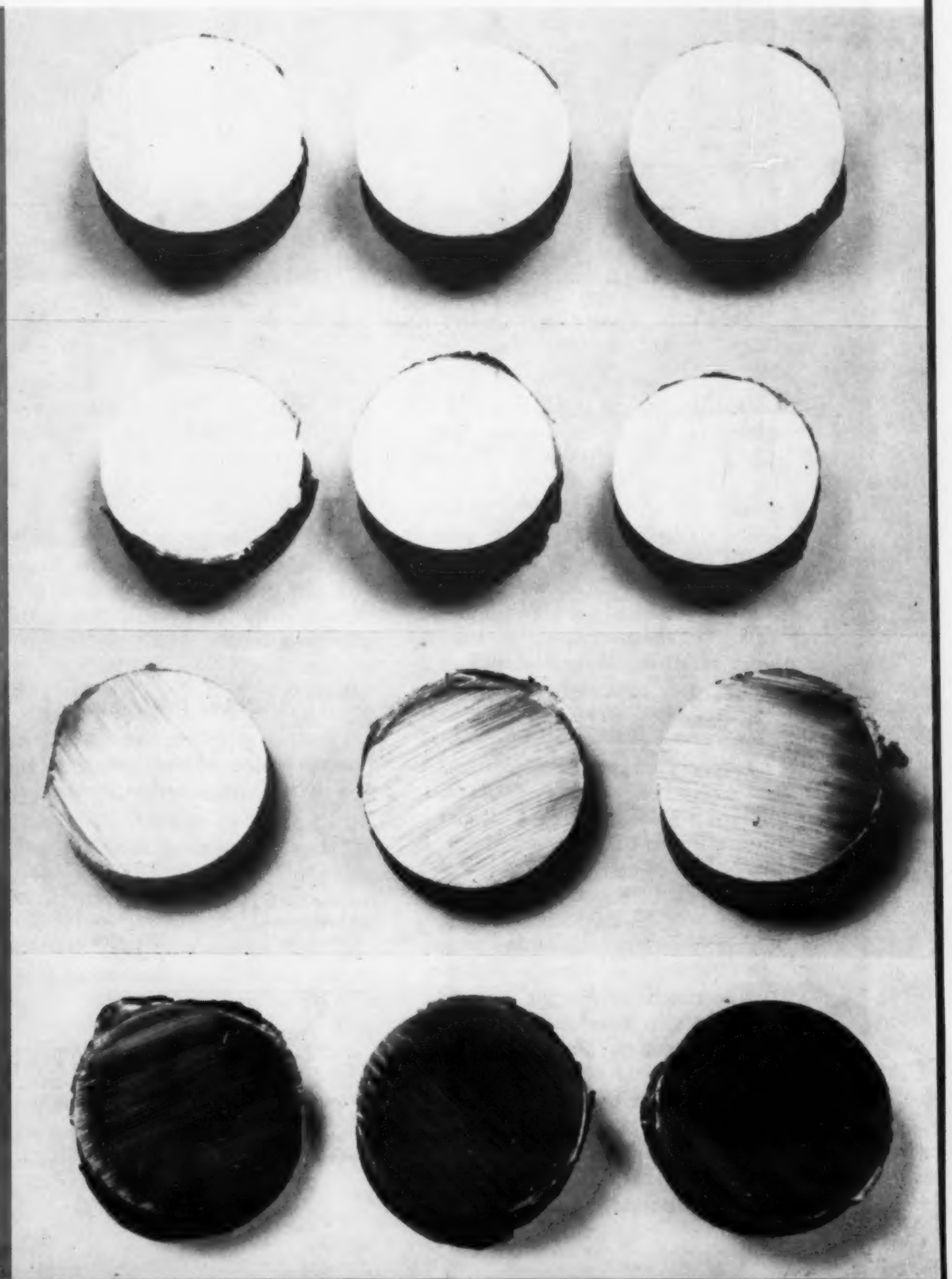
Characteristics of a good quality cut are shown by this sample piece: a light burr but no sign of burn.

MEDIUM

Trace of burn distinguishes medium quality cut of this sample. Medium quality has medium burr and burn trace.

POOR

Slow cut with coarse grit wheel produced a sample with the signs of poor quality: a heavy burr and a blue burn.



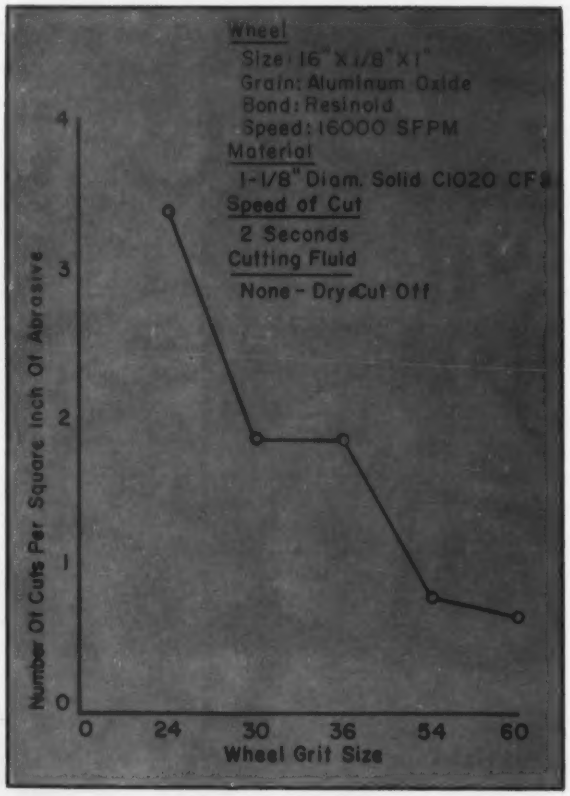


Fig. 1 . . Coarse grit wheels have longest life.

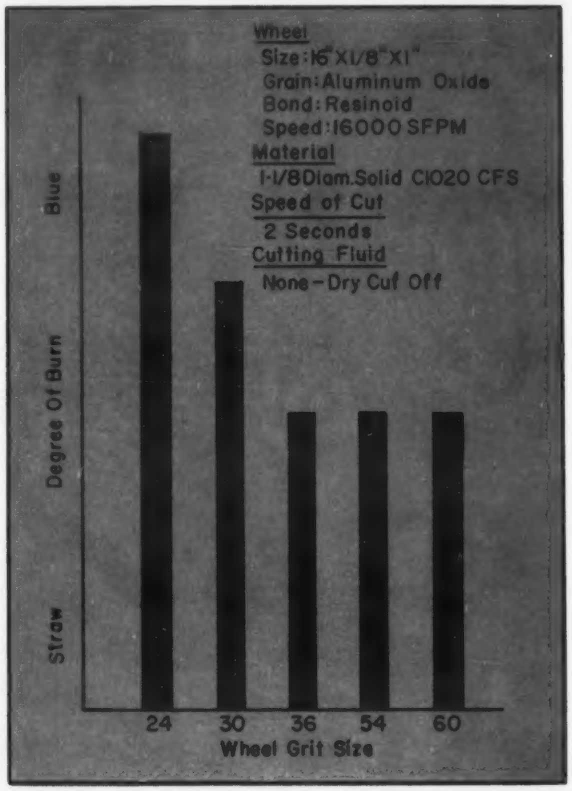


Fig. 2 . . Fine grit produces best quality cut.

Quality of cut and wheel life, therefore, oppose each other. If superior quality is desired it must be produced at the expense of wheel life and conversely if long life is desired, quality must necessarily be sacrificed to obtain it.

As in most operations involving the use of abrasives a compromise must be effected and in cut-off work a 30 or 36 grit wheel is a logical compromise between superior quality of cut and long wheel life.

Typical cuts produced by various grit size wheels are shown in photograph. Quality ranges from a blue burn to no burn and from a heavy burr to no burr.

The effect of grit size on wheel action may be summarized as follows:

- Grit size can change efficiency as much as 80 per cent.
- Grit size can change quality of cut from blue burn to no burn.
- Coarse grit wheels produce long life but quality of cut is sacrificed for it.
- Fine grit wheels produce excellent quality cuts but wheel life is sacrificed for it.
- A compromise between excellent quality and long life is the selection of medium grit wheels for the job. The 30 and 36 grit wheels will give good quality cuts with reasonable wheel life.

Wheel Thickness

Just as grit size can change the performance of an abrasive cut-off wheel, so can the thickness of the wheel alter the cutting characteristics of the wheel. Table 1 shows typical performance data produced by a 1/16-in. thick wheel and a 3/32-in. thick wheel in the same grading. Wheel life was reduced 53 per cent when the thickness changed from 3/32-in. to 1/16-in. Quality of cut, however, was improved by the use of the thinner wheel.

TABLE 1. EFFICIENCY WITH VARYING WHEEL THICKNESS

Wheel size	10 in. diam.
Wheel speed	4000 rpm
Material cut	½-in. diam.
Time per cut	1 second
Cutting fluid	none; dry cut-off

Results

	0.103 in. wheel thickness	0.067 in. wheel thickness
Diameter loss	0.099 in.	0.187 in.
No. cuts per sq in. abrasive	32.1	17.1
Per cent change	53	100

To obtain the most cuts from a wheel, use as thick a wheel as is consistent with the power available. Conversely, to obtain better quality of cut use a thinner wheel.

Wheel Grade

Wheel grade or hardness of wheel also contributes to and controls to a great extent the cost of the abrasive. The extent of the control that is exercised by the grade of the wheel is shown in Table 2. These data point out that a change from a medium grade wheel to a hard grade wheel changed the cutting efficiency 37 per cent. The change to the hard grade also produced more heat and this was reflected in the ability of the wheel to maintain parallelism of cut. Obviously then, a harder grade wheel will produce more cuts per wheel than a softer grade. The harder wheel, however, will generate more heat which will be reflected in the quality of the cut.

While these data reflect what happened in one situation and may not be used as general indication of what may happen in a different situation, they definitely point out that wheel grade and wheel cost are very closely related.

TABLE 2. EFFICIENCY WITH VARYING WHEEL GRADE

Wheel size	16 in. x ⅛ in. x 1 in.
Wheel speed	16000 sfpm
Material cut	1⅛-in. diam.
Time of cut	2 seconds
Number of cuts	25
Cutting fluid	none; dry cut-off

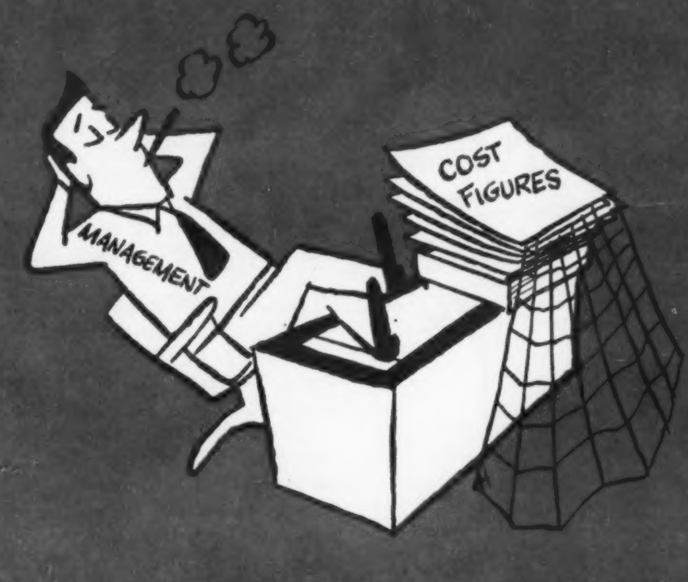
Results

	Medium grade	Hard grade
Wheel thickness	0.128 in.	0.126 in.
Diameter loss	0.570 in.	0.361 in.
No. cuts per sq in. abrasive	1.75	2.76
Per cent change	100	63

To select the optimum wheel grade for any one job is relatively easy. To generalize on wheel selection, however, is more difficult because of the many factors that affect the selection of an optimum wheel grading. These factors include such things as: type of material, area of material, production requirements, power available on the cut-off machine, condition of machine spindle and bearings, and quality of cut required.

How the type of material, the rate of cut, and the available power affect wheel performance have been outlined in the preceding article. With this background these general conclusions may be resolved concerning the choice of a wheel grade:

- When cutting hard materials use soft grade wheels.
- When cutting soft materials use hard grade wheels.
- When cutting large areas use soft grade wheels.
- When cutting small areas use hard grade wheels.
- When using low powered machines use soft grade wheels.
- When using adequately powered machines use hard grade wheels.



AN APPEAL TO FOUNDRY MANAGEMENT

J. A. WAGNER / *President*
Wagner Malleable Iron Co.
Decatur, Ill.

Technical excellence alone will not insure success in business

Not too many years ago the future of the foundry industry did not seem too bright—forgings and weldments were becoming more and more attractive to buyers. Recently much has been done to improve the quality of castings through better manufacturing methods and technical skills. Some managements have displaced hard work and long hours with today's team of good men of practical experience with a proportionate number of young men with college training using mechanized and technically controlled methods.

With this accomplished many executives feel that their job has been done. Unfortunately, this is far from the truth. Many others, in daily sales contacts, see the effects and suffer financially as a consequence of this *management neglect.* Personal interest by top management in having cost figures developed by the accounting department is a natural requirement if benefits are to be derived from today's team of men and machines. Without such knowledge the acquisition of equipment may not pay for itself—instead its investment may pass on to the customers because of improper cost accounting and pricing.

If executives lack an appreciation of the necessity of proper "cost finding" on a per pattern basis, it usually follows that the sales people at best will view sales prices projected by the cost accounting department only as a guide. Orders will follow at levels quoted by competitors who either are more efficient or suffer from an "inferiority complex" as to their own costs.

Most successful foundries are efficient producers of certain types and sizes of castings. On those products their costs are low. It does not, however, follow that their costs will be low on all types and sizes of castings. There is no such animal as a low cost foundry when applied to castings in general.

Procedures and principles of accounting, well prepared after much committee work on the part of our various foundry organizations, are available to all of us. Among others the *Manual of Principles and Procedures of Cost Accounting for the Malleable Iron Industry* is equally applicable to large and small, as well as mechanized operations. The Gray Iron Founders' Society, also has published work in this field. No further work of this character now seems necessary. Present necessity is that executives adopt one which appeals to them in their organization and then give an enthusiastic push for its installation and use.

Distributing Cost Items

Collecting all expenses into proper accounts in cost centers or departments, gives only the cost of the total output of the past. The problem remains to distribute those costs to castings by pattern number or classification for each of the operations performed. That is where the differentiation between the accounting department and the cost department first enters the picture.

Admittedly all operation expenses cannot be applied directly to a pattern number. And just as properly, many costs which occurred in a past period are not repetitive in the future. Therefore, many costs must be applied on a formula rate basis. It seems that nothing will be done in this complex accounting problem unless some executive determines that a solution must be found for that company.

Whether the operation be on a production or a jobbing basis, the accounting problem is the same. Knowledge of costs of producing the output in the past does not necessarily entitle one to properly cost similar production tomorrow with assurance of equal profits.

Careful consideration should be given to the probable expenses of each of the many operations in the period ahead, reflecting the most recent costs and adjusting them for anticipated future rate or cost changes. The so arrived at cost of a particular operation divided by the appropriate production factor can be expected to give a good "cost rate" by the hour, the pound or the piece (depending upon what the operation covers) for future production.

Expenses applied on a tonnage basis such as inspection, material handling, cleaning, or shipping are added to expenses which can be applied individually by the pattern number (molding, etc.), each with its appropriate element of factory overhead. The total is commonly called the "conversion" cost. Or stated another way, it represents the combined costs of one casting differentiated from another in respect to the expense of converting metal from the material inventory into a useful casting made to customer specifications.

Pricing Problems

Those who estimate costs for new work on inquiries from the sales department may be large or small in numbers of people, but unquestionably "large" in importance. Top management's approval of the work done by this group is a "must" in order to obtain work at profitable prices at predetermined production levels.

As an example assume an inquiry for a substantial number of castings to be needed daily for three or six months pursuant to an attached blue print. What problems confront your staff in the development of an adequate price? Further, what harm is done because your competitors fail to properly evaluate the engineering problems attached to the production of the part?

(1) The print as drawn by the customer usually pictures the part after machining. Therefore, it must be redrawn to show the outline as a casting.

(2) Prior knowledge is neces-

sary as to locations of machining operations, in order to determine location of parting lines, draft angles, and gate location.

(3) After cores are determined the unit weight of the casting can be calculated. (Too often weights are inaccurately or improperly arrived at because of the lack of attention to such details.)

(4) A rough layout of production equipment is next necessary. The type of flasks to be used may influence the molding center selected.

(5) Weight of metal in the mold must be determined. This requires the designing of the "gating system" to provide sound castings.

(6) An advance determination of approximate scrap losses in various inspection areas helps determine the quantity of castings to be poured and the cores needed. It should be recognized that numbers or pounds of castings will be different in various cost centers.

(7) Time study people should determine time required for the making of cores, molds, gate removal, pressing, machining or any other finishing operation which may be required by the customer's specification.

(8) Such pertinent information and the multiplication of the arrived at production factors by rates established in the budget or by the cost department should be recorded on a "cost card". Figures submitted to the sales department may or may not include a markup for profit. However, this is desirable and should be a rate which might be higher if unusual customers' returns were expected or if costing was considered inadequate. The cost system should provide that the profit rate is a percentage of conversion cost—not total cost.

(9) The cost of all equipment or tooling needed in the production of the contemplated order on contract must then be estimated and charged to the customer.

Cost-Finding Budget

This description is intended only as an outline. The challenge to executives should be apparent. It would be far easier and quicker for some wise old-timer to "size up" the job as being desirable or not (dependent upon the problems to be encountered) and guess at prices accordingly.

Regardless of the type of operations, the surest way to get profits is to adequately price the product. You can not do it without a knowledge of costs of the future and of time required for such production based on intelligent engineering data. Your organization will not go to the required effort or have confidence in the results unless you yourself help in the operations and give it your blessing.

A discussion of these considerations gives rise to the need for an "operating budget" which would form the basis for a "cost-finding budget". This budget, if based on a sensible yearly sales income prophecy, could reflect the probable cost of producing different classes of work. If the materials or the manufacturing processes change radically, an entirely new "operating budget" will be needed. Consequently some changes in cost rates will result from the revised cost-finding budget.

Most operators feel that budgets or costing through budget control are good or are useful for the other fellow. But yet they feel that budgets do not apply to them because their operations are small or confined to jobbing business. Of course, that is not true. Companies whose managements have little or no respect for collecting operational costs and use of same in an adequate cost-finding system for determining selling prices for products to be sold tomorrow are hardly those foundries whose stock would be considered "Blue Chip".

Anticipate Expenses

Costs of factory overhead items and of general administrative and sales expenses can be anticipated for the year. They should be budgeted and effectively controlled inasmuch as these expenses follow time rather than pounds produced or hours worked. Because experience teaches that no sensible sales forecast should assume full production for a year, it logically follows that these expenses must be absorbed into costs at a level of "normal activity". That is to say, a decision must be made as to the number of molding shifts which will provide the anticipated sales and this is to be considered as "normal" for the year.

The total of all operations costs of this projected production plus the budgeted overheads must equal the dollars of projected sales for a break even. If sales at this level cannot be attained it remains for management to seek means of reducing costs or face the necessity of asking for higher prices. Many managements feel that, not only should all manufacturing costs be absorbed at normal activity, but stockholders' dividends and debt retirement expenses should be earned also as representing a form of costs.

Continued on page 88

This article is condensed from a paper, "*An Appeal to Foundry Executives*," which was presented at an Industrial Engineering Session of the 1957 AFS Castings Congress and Engineered Castings Show.

SKILL PAYS OFF in Record-Breaking Kennedy Memorial Apprentice Contest

Close to 600 entries prove the growing interest and skill of youth entering the casting industry

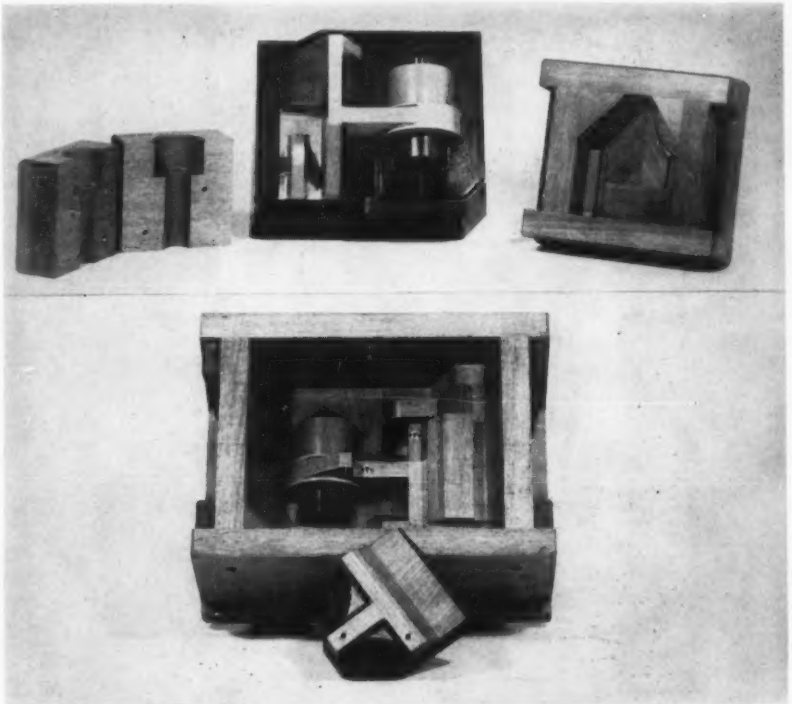
The top ranking efforts of over 580 apprentices in this country and Canada are pictured on these pages. First, second and third place winners of the record-breaking 1957 Robert E. Kennedy Memorial Apprentice Contest were selected from five classes of entries—wood patternmaking, metal patternmaking, iron molding, steel molding, and non-ferrous molding.

In this 34th contest, held annually since 1924, the winners received certificates and prizes of $100, $50, and $25 for the first three positions in each class. The prize winning entries were exhibited at the 1st Engineered Castings Show in Cincinnati where the first-place winners were brought as guests of the Society to receive their awards.

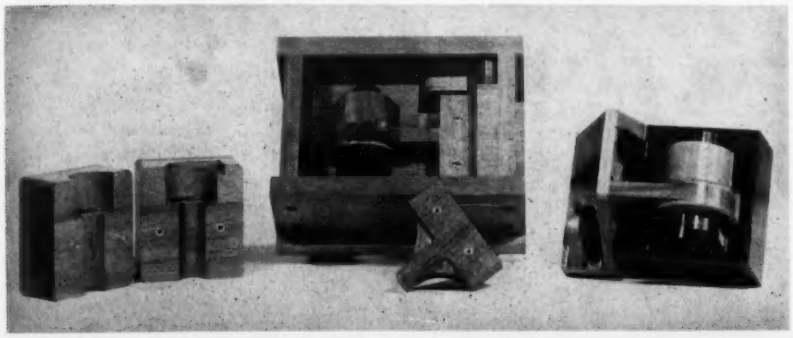
As the result of 15 local chapter elimination contests, the number of entries was reduced to 91, which were shipped to the Navy Pier Branch, University of Illinois, Chicago for final judging. The program was under the direction of Prof. Roy W. Schroeder, University of Illinois, chairman of the Apprentice Contest Committee.

Patterns for the molding contest were generously provided by the Accurate Matchplate Co., Chicago.

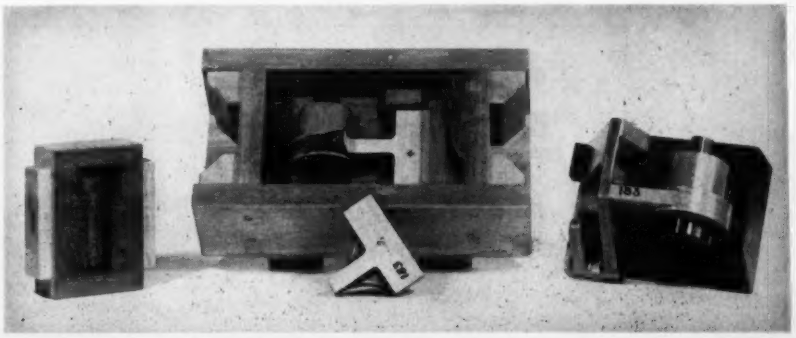
Winners in the All-Canadian judging were as follows: **wood pattern** – first place, M. Moon, Dominion Engineering Works, Montreal, Que.; second place, M. Hannah, Western Pattern Works, Montreal, Que.; third place, Robert Hawkins, International Harvester Co., Ltd., Hamilton, Ont. **Metal pattern** – William Harris, International Harvester Co., Ltd., Hamilton, Ont. **Iron Molding** – first place, J. Ridoressi, Montreal Technical School; second place, J. C. Ferron, Three Rivers Technical School, Three Rivers, Que.; third place, G. Brunet, Dominion Engineering Works, Montreal, Que. **Steel molding** – first place, A. Beaupre, Dominion Engineering Works, Montreal, Que.; second place, G. Cholette, Dominion Engineering Works, Montreal Que.; third place, J. Smith, Dominion Engineering Works, Montreal, Que. **Non-ferrous molding** – first place, J. Bedard, Three Rivers Technical School, Three Rivers, Que.; second place, R. Lord, Dominion Engineering Works, Montreal, Que.



1st Place Wood Pattern—Richard R. Dvorak, Consolidated Pattern & Mfg. Co., Brentwood, Mo., was rewarded for ingenious use of a slab core box. By making a slab core, awkward tucking of sand under the removable piece shown in foreground was eliminated, giving better finish.



2nd Place Wood Pattern—Vernon Koch, Caterpillar Tractor Co., Peoria, Ill., designed core print for more positive locating in the mold.



3rd Place Wood Pattern—Richard J. Schmid, Suburban Pattern & Model Co., N. Collingswood Hts., N.J., economized with a one-piece core box.

1st, 2nd, & 3rd Place Metal Patterns: 1st—W. Kuschel, Annex Pattern Co., Detroit. 2nd—M. E. Salsbury, Cleveland Foundry, Ford Motor Co., Berea, Ohio. 3rd—C. Evans, City Pattern & Machine Foundry Co., Detroit.

Iron Molding Winners: 1st—Ray Hollfelder, Zenith Foundry Co., Milwaukee. 2nd—Ronald Henderson, Olney Foundry, Link-Belt Co., Philadelphia. 3rd—Ralph Tolle, Waupaca Foundry Inc., Waupaca, Wis. Winners followed good foundry practices in producing their castings by gating into risers, using blind risers, and catching dirt in gate located in cope.

Steel Molding Winners: 1st—Arnold See, Waukesha Foundry Co., Waukesha, Wis. 2nd—Nathan Rosier, Atlas Foundry & Machine Co., Tacoma, Wash. 3rd—Elden Willing, Waukesha Foundry Co., Waukesha, Wis. All are riser gated.

Non-ferrous Molding Winners: 1st—Naaman Peterson, Puget Sound Naval Shipyard, Bremerton, Wash. 2nd—Robert Weber, City Terrace Foundry Co., Los Angeles, Cal. 3rd—George Martinez, Bay City Foundry Co., Wilmington, Calif.

Metal patternmaking winners: William Kuschel, Maurice E. Salsbury, and Clifton Evans.

Steel molding winners: Arnold L. See, Nathan Rosier, and Elden C. Willing took honors.

Iron molding winners: Raymond J. Hollfelder, Ronald Henderson, and Ralph W. Tolle.

Wood patternmaking winners: Richard R. Dvorak, Vernon S. Koch, and Richard J. Schmid.

Non-ferrous molding winners: Naaman Peterson, Robert Weber, and George Martinez.

Management

Management Development, William J. Grede, president, Grede Foundries, Inc., Milwaukee, Wis. At this, the first luncheon meeting sponsored by the new Management Development Committee of AFS, Mr. Grede noted that although AFS is not a trade organization it is concerned with the acceptance of castings in the competitive market. The problem of developing management, he said, is not a new one, but industry is more aware of the problem. "Industry has always found dealing with people, employees, customers and suppliers a very major part of their activities," he stated. Grede noted that the principle which can guide the development of the type of management necessary in the foundry is to recognize "an individual responsibility to recognize in all of the people that are associated with us their significance as persons." AFS, he said, must begin to work with its membership of technologists and production management people to impart to them a broader understanding of management problems in a free enterprize system.

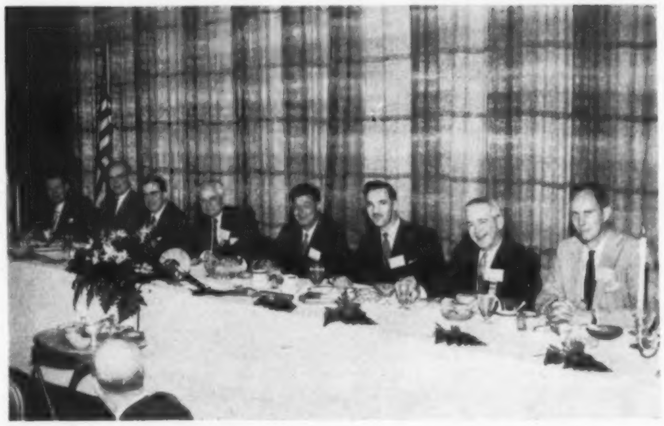
In the discussion following Mr. Grede's talk, AFS President Frank W. Shipley rose to answer a question with the remark that AFS will continue to develop men; along technical lines as previously, but now in management skills as well.

Malleable

Comparison of Properties of Liquid- and Air-Quenched Pearlitic Malleable Irons, Part II, report by AFS Pearlitic Malleable Committee (6-E), presented by R. W. Heine, University of Wisconsin, Madison. The 1957 report described processing and properties of pearlitic malleable irons produced by the cold-melt process. Both alloyed and non-alloyed irons were covered in the report. Continued from the 1956 report of the group was a comparison of liquid and air quenching, both followed by tempering, as the means of producing various A.S.T.M. grades of pearlitic malleable irons. The practices and results obtained from eight foundries producing the various A.S.T.M. grades were described, largely in the words of the foundrymen who provided the information.

In the discussion following the paper, further data was offered to support the committee's conclusions regarding the properties of liquid quenched iron. The discussion also indicated the preference of the committee for the use of machined test bars.

Combustion Controls for Duplex Furnace Operations, L. E. Emery, Marion Malleable Iron Works Div. Chicago Railway Equipment Co., Marion, Ind. For a period of three



AFS officials attending the annual Canadian dinner were: J. Perkins, M. G. McQuiggan, F. W. Shipley, A. W. Pirrie, L. H. Durdin, F. W. Kellam, Wm. W. Maloney, P. Von Colditz.

Extensive interest in sand was shown by the large attendance at the annual Sand Division dinner which featured a movie on engine block quality control.

AFS officials, officers, and directors attended the annual combined luncheon and business meeting held at the Netherland-Hilton Hotel on Tuesday morning.

Trustees of the Training and Research Institute and AFS officials from left are B. C. Yearley, G. H. Clamer, H. W. Dietert, Wm. W. Maloney, S. C. Massari, Hyman Bornstein, L. H. Durdin, F. W. Shipley, B. L. Simpson, I. R. Wagner.

First place apprentice winners receiving awards. R. R. Dvorak, R. J. Hollfelder, W. Kushel, and A. L. See. N. Peterson, also a winner, is in the armed service.

Participants at Light Metals session held at Cincinnati's Music Hall were R. E. Edelman, G. H. Schippereit, A. L. Feild, H. W. Antes, and D. H. Turner.

Meeting prior to Statistical Control session are W. K. Bock, R. L. Yard, J. J. Henry, E. C. Zuppann, A. M. Schneider and J. Hromi, from left to right.

Fundamental papers authors and chairmen discuss details of Monday's opening session.

years, the author studied the operation of his air furnace with a portable combustion analyzer and found it possible to make improvements in the operation of the furnace. Fuel consumption was reduced, refractory life extended, and it was possible to make more accurate predictions of carbon reduction. The investigation made with the portable instrument furnished data which the author has used to make a permanent installation of a continuous analyzer and a recording instrument.

The next step in the author's work will be to control the input of air and coal to the furnace directly from the controller. This information was developed by several questions from the floor regarding the installation.

Some Observations on Galvanizing Embrittlement of Malleable Iron, R. W. Sandelin, Connors Steel Div., H. K. Porter Co., Inc., Birmingham, Ala. Mr. Sandelin's experimental procedures have demonstrated that the galvanizing embrittlement of malleable iron is directly related to the phosphorus and silicon content in its chemical composition. The author found that increasing amounts of phosphorus, for a given silicon content, will change an iron not susceptible to galvanizing embrittlement to one which is highly susceptible to embrittlement. Immersion in molten zinc, pickling in acid, or dipping in neutral flux were not found to have any special effect on embrittlement. A pretreatment consisting of heating to 1200 F, followed by water quenching, before galvanizing, was found to eliminate the possibility of embrittlement. Slow cooling after galvanizing (without the pretreatment) was also found to tend to reduce embrittlement. Fracture tests were found to be a reliable means of evaluating embrittlement.

Effects of Charge Materials and Melting Conditions on Properties of Malleable Iron, E. H. Belter, Bechtel Corp., San Francisco and R. W. Heine, University of Wisconsin. This paper was the sixth progress report on a research proj-

New National Directors of AFS

William D. Dunn

John R. Russo

Henry G. Stenberg

Fred J. Pfarr

A. A. Hochrein

K. L. Landgrebe

Allen M. Slichter

Charles E. Drury

Malleable's first meeting featured three technical papers. Authors and presiding officers were L. E. Emery, R. W. Sandelin, H. C. Stone, R. W. Heine, and E. J. Stockum.

Reviewing the program before the start of the Steel Session are R. D. Engquist, A. E. Gross, A. J. Kiesler, J. J. Chyle, D. L. Hall and V. E. Zang, chairman of the division.

Sand Division authors and program chairmen enjoy a light moment. They are R. W. Heine, K. G. Presser, Franz Moser, C. E. McQuiston, D. J. Pusack, W. R. Moggridge.

ect initiated and sponsored by the Research Committee of the AFS Malleable Division. The researchers reported on their study of four points: the effect of pig iron variations in the charge on the casting properties, mechanical properties, and annealability of malleable iron; variations in melting technique that change residual element recover after melting; the correlation of silicon oxidation with changes in residual element recovery; the effect of holding time at 2800 F on the mechanical properties of malleable iron. From the study, the authors concluded that the effect of pig iron in the charge is related to the changes in chemical composition that accompany its use and its resistance to oxidation under oxidizing melting conditions other than free oxygen. Mixed charges containing pig iron were shown to cause uniformly good first and second stage annealability. Recovery of residual elements from the pig iron was found to be virtually independent of the degree of oxidizing or reducing melting conditions.

C. F. Joseph and J. E. Rehder, presiding officers at the session, congratulated the authors on the conclusion of this AFS Research Project. A summary of this investigation may be published at a future date, it was disclosed.

New Foundry Testing Methods, Carl A. Koerner, Central Foundry Division, General Motors Corp., Saginaw, Mich. Better quality castings to meet competition result when new foundry testing methods described by Mr. Koerner are used. The methods include the use of cobalt radiography, a sonic tester that uses sound waves to detect defective castings, and an electronic sorter which separates hard and soft castings. Development of testing techniques such as these, the author stated, requires teamwork within and between the foundries of our industry. Such development will maintain and improve the competitive position of castings.

During the discussion session Mr. Koerner stated that a 30 currie 60 cobalt radiographic machine is used because sections up to 3 in. are tested. In many of the nondestructive devices a good standard casting must first be obtained. The speaker explained that usually this standard pattern is obtained by radiographic inspection.

Investigation of the Effect of Processing Variables on Mechanical Properties of Pearlitic Malleable Iron, H. H. Johnson and W. K. Bock, National Malleable and Steel Castings Co., Cleveland. Because of the close interrelationship of the variables, the authors conducted their study following a "designed experiment" approach. Data were examined on the basis of both statistical and metallurgical importance. The authors found that correlations and interactions between quenching rate, tempering temperature, and quenching time were significant and could be evaluated. The effect of quenching rate on yield strength values was found to have particular significance. The effects of surface condition of test bars on mechanical properties was found to be significant, especially for tensile strength at high strength levels.

Malleable Round Table Luncheon

Castings From the Users Standpoint, Thomas Logan, Caterpillar Tractor Co., Peoria, Ill. Mr. Logan described the use of malleable cast parts in an earthmoving machine and stated the reason for each particular application. He also remarked that the greatest deterrent to the application of castings is casting defects. Mr. Logan showed parts that his company has converted from fabrication to casting at savings to 30 per cent, and he emphasized that foundries must stop sending defective castings to their customers.

Metal Core Box Equipment, W. E. Mason, Westinghouse Air Brake Co., Wilmerding, Pa. Mr. Mason stated that until recently only larger producers of castings used production metal pattern equipment.

Discussing the growing use of resins are pattern group D. T. Kindt, J. B. Templeman, H. A. Burton, J. M. Kreiner.

Hearing and radiation panel, K. M. Smith, P. J. Whitaker, J. R. Allan, reviews papers.

Education session co-chairmen P. E. Rentschler and F. G. Sefing check speaker J. S. McCauley's publication on foundry labor.

Malleable luncheon speaker Thomas Logan gave producers a picture of the buyer's problems.

Sand Division Dinner speaker W. C. Schartow traced production of Chevrolet V-8 block castings.

However, he said, it is becoming increasingly evident that if foundries are going to compete with other fabricators, castings must be made more accurately and with lower direct labor costs. Metal core box equipment, he pointed out, is the only type capable of taking the continuous hard wear encountered in producing castings in volume.

A step-by-step sequence of slides were used to show the production of a core box for a valve incorporating 27 valve ports. The speaker also outlined procedures for using blow-in drier equipment in higher production runs. Essentially the method is the same as making ordinary blow equipment except that no bottom half core box is necessary. Instead, the drier is used as the other half of core box.

Mr. Mason recommended the use of a wood core stick in metal core box production. These are exact reproductions of the core with core prints added. They are the most economical way of producing master core box equipment. Assembled in checking fixtures they are made so the patternmaker can determine by visual inspection whether or not there are any close places in metal walls and whether port openings are in their proper location.

Engineering Aids for Sealing Core Boxes Against Blowbys, R. L. Olson, Dike-O-Seal, Inc., Chicago. Mr. Olson described the use of dike-type synthetic (silicone) rubber seals which are molded into the core box to prevent mismatch. He reported that one automotive foundry has made 500,000 cores in a dike-equipped core box without one blowby.

Cast Epoxy Pattern Equipment, J. B. Templeman, Templeman Pattern & Model Co., Chicago. Mr. Templeman's experiences have indicated plastic pattern equipment to be superior to aluminum of the same design and in similar applications. He reported one production foundry produced 225,000 cores blown from an abrasive resistant plastic core box. This box has been in operation two years with less than ten hours required for maintenance.

Blow type core boxes, he reported, may be expected to deliver 25,000-100,000 units, depending upon design and material. Initial costs will vary with different foundry applications but lower costs will be realized over extended runs compared to conventional machined metal patterns.

Answering a question from the floor, the speaker said that jolt-type operations are not too severe an application for the epoxies. On cooling rates, the speaker said that epoxies curing at room temperatures generally are useable in eight hours, this can be cut, he pointed out by additives.

Plastics in Patternmaking, Harry Burton, Canadian Steel Foundries Ltd., Montreal, Que., Canada. New patterns and core boxes at the speaker's foundry are now being produced exclusively from plastic. Some core boxes have been in service for more than 75,000 cores with excellent results. Mr. Burton has worked with epoxy resins since 1954 and reports that plastics offer these advantages over metal: reduction in cutting and grinding tools in the pattern shop, faster and cheaper reproduction of patterns, economical maintenance due to simpler methods of repair, and the ability to reproduce intricate work.

Other properties of epoxies include high dimensional stability, good adhesive qualities, excellent wetting ability, easy release from sand, high compressive strength, and good impact abrasive resistance.

Lower initial costs were the reason for trying epoxies. This still remains their chief advantage. However, the speed, ease of repair, and better cores made due to reduction of draft and loose pieces have contributed to their increasing use. The greatest cost benefits have come from complex patterns and core boxes. The more intricate the contours and shapes, the greater the savings in plastic over metal. In some cases plastic patterns have been produced for one-eighth the cost of metal.

The likelihood of encountering dermatitis was covered at the discussion session. Certain individuals appear to be more susceptible, the speaker said. If workers suffer from exposure, remove him from the job, Mr. Burton recommended. Fourteen men are employed in his pattern department. Only two men have suffered from exposure.

Wear Characteristics of Plastic Pattern Materials, M. K. Young, U. S. Gypsum Co., Chicago. Mr. Young reported on a survey of complaints and problems in the use of plastic pattern equipment. He noted that an A.S.T.M. abrasive test has been adopted as a means of evaluating the wear-resistance of the new pattern materials. Proper use of materials, an exacting technique, and employment of wear pads will produce plastic pattern equipment with satisfactory wear characteristics, he indicated.

The Patternmakers Application of Plastics in Industry, J. F. Roth, Cleveland Standard Pattern Works, Cleveland. Mr. Roth discussed the advantages of plastic materials in the repair or reproduction of existing patterns. He also noted that patternmakers now have the opportunity to make plastic die models, jigs, and fixtures for the automotive and aircraft industries.

Plastic Patterns, J. W. Tierney, Houghton Laboratories, Inc., Olean, N. Y.; T. O. Mahaffey, Kish Resin Sales Co., Cincinnati; M. K. Young, U. S. Gypsum Co., Chicago; W. J. Olsen, U. S. Naval Shipyard, Bremerton, Wash.; J. F. Roth, Cleveland Standard Pattern Works, Cleveland; H. A. Burton, Canadian Steel Foundries, Ltd., Montreal; J. B. Templeman, Templeman Pattern Works, Chicago. This panel answered specific questions regarding the application and production of plastic pattern equipment.

Pattern Round Table Luncheon

European Foundries and Pattern Shops, D. T. Kindt, Kindt-Collins Co., Cleveland. Mr. Kindt, speaking at the Pattern Round Table Luncheon summarized the observations made during a European visit which included attending the International Foundry Congress at Dusseldorf, Germany, and plant inspections in England, France, Switzerland, Holland, and Belgium.

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Congress News Story

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Mr. Kindt was particularly impressed with the extensive pattern exhibits at the International Congress and with the operating exhibits manned by patternmaking apprentices. The type of pattern wood and the care devoted differed considerably from American practices, he reported.

One day was spent at the Esher Wyss Co., Zurich, Switzerland, and various jobbing shops and automotive plants were visited in France. As a result of the visit, Mr. Kindt was able to make interesting comparisons between European and American patternmakers—their abilities, working conditions, equipment, and pay scales.

Steel

Welding of Steel Castings with the CO_2 Welding Process, John J. Chyle, A. O. Smith Corp., Milwaukee. The speaker outlined applications of this process to the salvage and fabrication of steel castings. The carbon dioxide shielded metal arc welding process is getting considerable attention in the industry today and appears to be one of the most significant welding developments in the past several years, the speaker said.

Advantages of the process include: a potential for welding cost reduction; the production of excellent metal quality; and an automatic welding process using a visible arc not requiring a flux for protection, thereby eliminating problems related to slag removal after welding.

Various examples of applications of the process were shown as well as a comparison of costs with other welding processes.

The question of minimizing hot cracks in welding large sections was raised during the discussion period. For this Mr. Chyle recommended the use of staggered boxes. This, he stated, will eliminate most of the trouble. The speaker, in answering questions concerning welding in cramped quarters, emphasized that accessability is needed to obtain satisfactory welds.

Effect of Carbon and Manganese on Properties of Constructional Steel for Dynamic Loading Appli-

cations, R. D. Engquist, American Steel Foundries, East Chicago, Ind. Development of a higher-manganese, lower-carbon alloy composition has demonstrated improved qualities over Grade B steel in shock loading and low temperature service conditions.

This investigation centered around problems in service failures found in cast members for railroad application but the problems are encountered in other fields as well.

Faster railroad speeds and increased loads per freight car operation have increased service failure of cast B steel components particularly during winter months. Thawing effects on the road bed cause rough riding conditions which subject truck members to severe shock loads.

Dropping the carbon content to about 0.18 per cent and increasing the manganese content to about 1.20 per cent has solved both the problems of static strength and impact. This modified composition is also one-third less prone to hot tearing in the normal pouring range. There is no significant difference in metal fluidity between the new composition and Grade B steel. Weldability is also satisfactory and no abnormal hardening of weld areas occurs.

Benefits to foundrymen from this composition indicated by the investigation include less susceptibility to hot tearing, decreased likelihood of service failures, and ready weldability. Customer benefits are more effective surface hardening of local wear, increased resistance to brittle fracture, and good weldability for cast-weld fabrication of members.

Comments on this paper pointed out that the paper focused attention on a very important property of steel, its impact strength. Spectacular ship plate failures emphasize the significance of shock resistance in the wrought steel field.

Hydrogen as it Affects Steel Castings, A. F. Gross, Ohio Steel Foundry Co., Springfield, Ohio. Mr. Gross divided the effects of hydrogen in cast steel into two categories. First, the temporary effects such as loss of tensile ductility which can be eliminated by aging. Second, permanent defects such as porosity

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and micro-shrinkage.

The manner in which hydrogen is absorbed and the mechanics of formation of various types of defects are fairly well understood, he reported. Analysis of the factors involved has enabled steel foundrymen to eliminate the permanent type defect through controlled melting practices and molding techniques.

Steel ductility increases as the rate of load application increases. Thus notch ductility, as measured by the impact test, is not affected. Mr. Gross emphasized the importance of this characteristic since most service failures result from notch sensitivity. In hydrogen service at high temperatures the cast material, if sound, should be as resistant as wrought material.

The discussion concerned how moisture can be reduced during pouring. Proper pouring techniques and dry materials were recommended by the speaker. Temporary and permanent defects can be controlled, Mr. Gross pointed out by improved methods. New techniques need not be employed, he said, it is a matter of applying proper controls.

Austenitic Manganese Steel Technology in an Australian Foundry, Hedley Thomas, Industrial Steels Ltd., Sydney, Australia. Melting of the steel is done in three ways. Direct melting is the usual practice and is easier to control; mild steel scrap and sufficient ferro-manganese are used to produce an alloy containing 11 per cent manganese and 1.0-1.1 per cent carbon. Indirect melting is employed where heterogenous scrap must be used. Dead melting utilizes 100 per cent austenitic manganese steel scrap.

Ladles used are lined with standard grade fire brick and mudded with fire clay. At one time teapot type lip-pour ladles were used but this has been discarded. Bottom pouring using a magnesite nozzle and a graphite stopper has been very successful. It has been found that metal temperatures in excess of 2900 F causes erosion of the nozzle and stoppers but if the met-

al temperature is controlled the trouble with running stoppers ceases. The ideal pouring temperature is about 2800 F.

Heavy castings are made with dry sand molds with 80-85 per cent of the production made in green sand. Most of the green sand molds are made with sandslingers with some light casting molds made with jolt-squeeze machines.

Castings are charged into a hot furnace and sections up to 1 in. attain a temperature of 1975 F in about 75 minutes, then soak for an equal time. In all cases the initial heating is to the 1375-1475 F range for a short soak. From this temperature the heating is quite rapid to 1975 F when the carbide dissolving is started. The temperature is allowed to fall to 1925 F by the end of the soak.

Quality Control for the Foundry Foreman, Jules J. Henry, Missouri Steel Castings Co., Joplin, Mo. Mr. Henry pointed to the need for quality control programs and explained how the foreman should share in the responsibility for the program. He also suggested ways that supervision can use statistics to control quality and explained the factors that must be controlled. Included in the paper were examples of specific uses of charts and graphs in foundries and how they can be of use to the foundry foreman.

In a comment from the floor, it was emphasized that a good quality control system gives the foundry foreman an immediate warning of trouble in the casting process.

Statistics at General Electric, J. H. Davidson, General Electric Co., Schenectady, N. Y. Presented by W. Jay Merrill, General Electric Co. Mr. Davidson's paper explained how his company gathers data for its statisticians and just what problems can be solved by statistical methods. He also explained how a multiple regression technique is used to predict sales several months in advance. He reported that the results obtained have been sufficiently accurate.

Administrative Engineering Applications of Statistical Methods, J. L. Dolby, General Electric Co., Schenectady, N. Y. Presented by W.
Continued on page 91

FIRST FOUNDRY TRAINING COURSES SCHEDULED

The first series of one-week foundry courses have been officially announced by the Board of Trustees, AFS Training & Research Institute. Starting in August and running through September, several intensive practical courses on foundry sand technology will be presented at Rackham Memorial in Detroit. According to S. C. Massari, institute director, "a one week laboratory sand testing course will be given three times, followed by two different week-long lecture courses on sand technology."

During the week of September 23, at the Marquette Management Center, Marquette University, Milwaukee, another Institute course entitled "Foundry Cost Reduction through Better Methods and Performance Standards" will have its inception. Dr. M. E. Mundel, author of over 60 publications on industrial engineering and management, will conduct this course.

And for those seeking cupola "know-how" the Training Institute has tentatively scheduled six days of lectures by top-ranking cupola experts in December at the University of Illinois.

The first course scheduled in the educational program, "Laboratory Sand Testing," will train foundrymen in the technology of testing sands in the laboratory. In this course, basic to the entire industry, men will be given an intensive one week training in a completely equipped sand laboratory set up at the Rackham Memorial Building at Detroit. Limited to 25 students, to allow for individual personalized instruction, the course will be given three times: July 15-19, Aug. 19-23, and Sept. 9-13.

Top men in this field will serve as course instructors. A partial list includes S. C. Massari, AFS Technical Director, and the following men from the Harry W. Dietert Co.: H. W. Dietert, V. C. Rowell, A. L. Graham, and R. Daksiewicz.

The laboratory course will run complete sand tests, including: 1) base properties, 2) green properties, 3) air-set strength, 4) dry properties, 5) hot properties, 6) retained strength, 7) mixing, 8) sand control records, 9) core sand mixing, 10) green core properties, and 11) baked core properties.

On the dates, Sept. 16-20 inclusive, the first AFS lecture course, Foundry Sand Technology I, will be presented at Rackham Memorial. Limited to a maximum of 200 foundrymen, this course takes up such subjects as: sand processing in the plant—automation of sand systems—reclamation—casting defect identification—special sands—cores. The same group of high calibre instructors for the laboratory course will teach this lecture course.

An advanced lecture course, Foundry Sand Technology-II, will follow at the same location with the same staff on Nov. 4-8 inclusive. This course is designed for sand experts and men who have completed the first two courses.

This Institute course has a broad scope dealing with such subjects as statistical methods, mold wall movement, mold wall fracture, mold atmosphere, heat transfer, mechanical sand properties, metal penetration, casting finish, high frequency heating of sand specimens.

Of considerable interest to foundry management and production personnel is the AFS Institute Course entitled "Foundry Cost Reduction through Better Methods and Performance Standards." Scheduled for Sept. 23-27 inclusive, at the Marquette Management Center, Marquette University, Milwaukee, the development of the course and presentation will be under supervision of Dr. M. E. Mundel, vice director of the Management Center.

Dr. Mundell, an internationally recognized authority in his field, will be assisted by a specially selected staff of foundrymen including members of the AFS Industrial Engineering & Cost Committee. The staff includes J. A. Westover, Westover Foundry Engineers, R. A. Gongwer and R. E. Trunnell, Jr., staff industrial engineers for Deere & Co.

The course will be a practical one for foundry time study men with lectures, discussions, and practical work assignments. Cost cutting "ideas" will be converted into "know how" by the practical presentation of this course which will cover such subjects as—techniques for developing better work methods from product flow to bench work—developing time study data and reducing it to practical usable form—rating performance of workers—using time study for better production control and cost control.

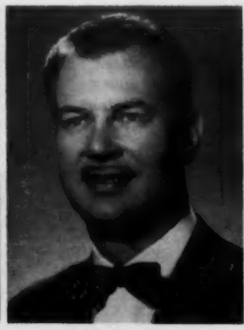
A fifth AFS Institute Course on "Cupola Melting of Iron" has been tentatively scheduled at the Navy Pier Branch, University of Illinois, Chicago, for Dec. 2-7 inclusive. Prominent cupola experts will be engaged to teach this important course.

The twenty-one major subjects to be emphasized in this important foundry subject are: 1) cupola design and construction, 2) raw materials handling equipment, 3) raw materials purchasing, 4) coke, 5) preparing the cupola bed, 6) charge preparation, 7) blast, 8) control of melting temperature and rate, 9) metal control, 10) cupola records, 11) desulphurizers, 12) finishing the heat, 13) slagging, 14) operating problems, 15) forehearth and ladles, 16) equipment for metal temperature measurement, 17) cupola emissions, 18) alloys, 19) cupola lining, 20) combustion in the cupola, 21) metallurgy of cast iron.

Tuition for the courses is as follows: Foundry Cost—\$120, including lunch daily; Laboratory Sand Testing — \$100, including lunch daily and dinner Thursday; Sand Technology I or II—\$50, including lunch daily and dinner Thursday; Cupola Melting — \$50, including lunch daily. S. C. Massari, AFS Training & Research Institute, Des Plaines, Ill., is in charge of registration for all courses.


S. C. Massari
Institute Director


H. W. Dietert
Sand course lecturer


V. M. Rowell
Sand course lecturer


R. E. Trunnell, Jr.
Management lecturer


Dr. M. E. Mundel
Management lecturer

East Coast Foundrymen Look At Future Techniques

J. H. Schaum / *Editor*

Close to 300 foundrymen were attracted to the East Coast Regional Foundry Conference to participate in a program covering three major themes – (1) New Developments in the Use of Plastics, (2) The Nuclear Energy Program and the Foundry Industry, and (3) New Developments in Foundry Equipment. These subjects were explored in three half-day sessions, April 12 and 13, at the Benjamin Franklin Hotel in Philadelphia.

Following the tradition of taking turns, this year the host was the Philadelphia AFS Chapter with Chesapeake and Metropolitan Chapter members supplying considerable assistance on the various committees. General Conference Chairman Walter Giele, Walter Giele Co., was aided by co-chairman R. A. Colton, Federated Metals Div., American Smelting & Refining Co., and L. H. Gross, American Radiator & Standard Sanitary Corp.

The conference was opened by words of welcome from AFS Director W. A. Morley, Link-Belt Co. A message from AFS Vice President H. W. Dietert, Harry W. Dietert Co., described the educational courses scheduled for presentation this fall by the AFS Training and Research Institute.

The technical program began with a talk by another national Director, O. J. Myers, Reichhold Chemicals Inc., speaking on the subject *"Plastics as Bonding Materials."* The various plastics or resins used as core binders were divided into a number of categories. The two basic types are "natural" and "synthetic". Animal, vegetable, and mineral resins comprise the "natural" group with thermoplastic and thermosetting making up the "synthetic" family. Heat treated rosin, a vegetable resin, is combined with a drying oil to make one of the core binders.

The synthetic resins are derived from coal, natural gas, and petroleum. One of these, phenol formaldehyde, is thermosetting and has proven to be a key to success of the shell molding process. The synthetic resins have the advantage of low organic content, high strength, fast baking, and good collapsibility. The trend today is away from the addition of powdered phenolic resins to sand and toward the coating of sand with resins dissolved in a solvent which is later removed by evaporation. Coating is also being accomplished by melting lump resin in contact with hot sand to attain a film deposit around sand grains. Coated sands are especially beneficial in shell core blowing operations.

An entirely different use for plastics was described by M. K. Young, U.S. Gypsum Co., in his talk entitled *"New Ideas for Patternmakers."* Pattern shops are turning more and more toward the making of patterns and core boxes from epoxy resins because of their low shrinkage, ease of fabrication, wear resistance, and excellent sand release characteristics.

General conference chairman, Walter Giele, is flanked on the left by co-chairman L. H. Gross and at right by co-chairman R. A. Colton. Mr. Giele is chairman of the Philadelphia Chapter, Mr. Gross is chairman of the Chesapeake Chapter and Mr. Colton chairman of the Metrolpolitan Chapter. These groups were sponsors of the conference.

In one instance a $15,000 metal pattern was made for $1200 in epoxy resin. If a mold for the plastic is being made in plaster, added strength is gained by working hemp into the plaster before it sets. For those who are allergic to the amine hardener, a low toxicity chemical has been developed. Heat resistant epoxies are being used for core driers that reach 225 F in dielectric ovens.

After a well attended luncheon, Harry Kessler, Sorbo-Mat Process Engineers, entertained the foundrymen with stories of his experiences as a boxing referee. A movie of the Moore-Marciano heavyweight title bout, refereed by Kessler, was then shown.

The afternoon technical sessions were devoted to emphasizing the impact of atomic energy on the foundry industry. Speaking on the subject *"Metallurgical Requirements for Atomic Applications"*, J. M. Simmons, Chief Metallurgical Section, Atomic Energy Commission, pointed out that the first nuclear reactor is only 14 years old and already 231 reactors are either built or in the process of building. The parts of a reactor have metal requirements peculiar to atomic radiation. Some alloys must be transparent to neutrons while others must absorb them.

Considerable stainless steel is being used for accessory equipment but extensive efforts are being expended to use the cheaper plain carbon steels. Cladding the carbon steels has proven an economical way of improving corrosion resistance. Control rods in the reactors are being made from stainless steel containing one per cent boron.

The second speaker on the nuclear energy program was Prof. W. A. Pennington, University of Maryland. His subject was *"Applications of Radioactive Materials in the Foundry."* The characteristic of radioactive isotopes and their method of manufacture were described in some detail. Cobalt-60 has been used in radioactive gages to measure the height of molten iron in the cupola. The source of radioactivity is located on one side of the cupola and the detector on the other side. The intensity of the beam will be markedly changed if the molten metal level rises into the path.

Cobalt-60 is also receiving extensive use in radiography to (1) determine shrinkage in castings, (2) aid in design of gating and risering systems, and (3) as a non-destructive acceptance test. As a tracer this same isotope has been used to measure the wear of furnace linings.

The evening banquet was climaxed with an oration by one of the top

public speakers in this country, Dr. Kenneth McFarland, Educational Consultant for General Motors Corp. A series of amusing and appropriate anecdotes were blended into the message that it is the "U" in foundry or business that is most important to success.

Four speakers on the Saturday morning session demonstrated the importance to the foundry industry of such new developments as the CO_2 process, pressure molding, shell mold and coremaking, and vibrating conveyors.

"Carbon Dioxide Process" by W. E. Gruver, Meehanite Metals Corp., explained the influence of moisture, grain size and shape, clay and fines on the final physical properties attainable with cores made by the CO_2 process.

T. E. Barlow, Eastern Clay Products Dept., International Minerals & Chemical Corp. followed with a talk on *"Diaform Molding Equipment."* The speaker emphasized the importance of using an excessively large diaphragm so that it does not become stretched when the air pressure forces it against the sand. The use of an upset on top of flask was explained. Advantages of this process result in lower wear on pattern, higher green strength, harder molds, and lower moisture content required in sand.

"Shell Mold and Coremaking Equipment" was described by O. W. Winter, Beardsley & Piper Div., Pettibone Mulliken Corp., and demonstrated in a motion picture. According to the speaker, the use of the dry resin sand mix is obsolescent. Compared with resin coated sand it uses double the resin therein doubling the cost and gas evolution. Coated sands have flowability four to five times that of dry mixes. Best shells result if sand drops vertically a sufficient height to give a high velocity impact. Heating of pattern and curing of shell are accomplished by radiant heating.

John Chahbandour, Carrier Conveyor Corp., brought the conference to a close with his paper on *"Vibrating Conveyors in the Foundry."* The speaker described the mechanical operating features of vibrating conveyors. Some of the jobs they are doing in the foundry are: separating castings and sand, cooling castings, separating back-up shot, rolling-over castings, air-quenching castings, receiving cleaning machine discharge, and conveying past sorting stations.

Much of the Conference success was due to the efforts of J. M. Robb, Jr., Chairman of Arrangements Committee, E. C. Klank, Chairman, Publicity Committee, and H. R. Williams, Reception Committee Chairman.

At Magcobar's Des Plaines, Illinois, laboratory, A. H. Zrimsek uses modern methods for foundry sand research.

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If costing procedures are tied into quotations and costs are controlled, it can be assumed that resulting expenses and incomes will fit this picture if the years activity rate is obtained. If expenses creep up or incomes drop for a sustained period of time, it indicates that normal is at a lower than predicted level. Overheads will be a larger proportion of total costs, requiring a higher average selling price or lower operating costs or reductions in overheads in order to break even.

Equipment Depreciation

Another point of general controversy is the amount of equipment depreciation which the cost finding budget should assume and the manner in which that expense should find itself as a part of the cost of an individual casting. One approach is to fix a realistic replacement value to all principle items of machinery and to charge into costs that amount indicated by the remaining years of useful life of the asset. The amount so determined is a yearly charge to the cost center in which the equipment is used. A serious mistake in cost finding for purposes of determining selling prices, is leaving equipment depreciation in a general overhead account as many do.

If the executive has provided for the installation of an adequate accounting procedure he needs to develop an estimating or engineering department. This group requires the cost data supplied by the cost department.

If estimators are following these steps it is well to set up procedures to check estimates on work which is obtained. That should at least cover the accuracy as to the calculated unit weight, the metal weight in the mold, the unit weight of cores, the productivity of coremaking, of moldmaking, of gate removal and other specific finishing operations and the rates of scrap at various manufacturing stages.

Any company which indulges in any form or degree of mechanization, must recognize that the lessened labor cost in the operation effected must be offset by the depreciation of the new asset, the power to run it and the mainte-

nance expense needed to keep it running. At least all of these cost factors need to be taken into account. Before reaching a decision as to whether the purchase of a particular piece of equipment will be justified consider these criteria: Improvement of quality of product, improvement in working conditions, and reduction of costs.

Here is an example of the accounting problem when change in methods occur:

Preparing Molded Sand

Method No. 1

Hand preparation at molder station.
Shovel and water pail needed.

Method No. 2

Machine preparation at molder station.
Sand cutting machine and water pail needed.

Method No. 3

Machine preparation and distribution from central plant.
No hand tools used.

METHOD	1	2	3
LABOR			
Sand Cutter (6 @ $3,500)	$21,000	x	x
Cutter Operator (@ $4,000)	x	$12,000	x
General (1 @ $3,500)	x	$ 3,500	
(2 @ $4,000)			$ 8,000
	$21,000	$15,500	$ 8,000
LABOR EXTRAS			
Shift Differentials	x	x	x
Overtime Premium	x	x	$ 1,000
Delay Time	x	x	x
Allowances	x	x	x
	x	x	$ 1,000
Allocated Expences following Payroll @ 20% of Labor)	$4,200	$ 3.100	$ 1,800
Total Labor Cost	$25,200	$18,600	$10,800
SUPPLIES			
Small Tools	$ 1,000	$ 500	$ 100
Sand	5,000	5,000	8,000
Bonds, etc.	x	x	1,000
Allocated Electricity	x	300	1,500
Repair parts used	x	2,000	2,000
Total Supplies	$ 6,000	$ 7,800	$12,600
Allocated Machinery Depreciation	x	$ 1,000	$15,000
Allocated from Maintenance Dept.	x	1,000	5,000
	x	$ 2,000	$20,000
Total Burden Cost	$ 6,000	$ 9,800	$32,600
Supervision & Clerical	$ 3,000	$ 3,000	$ 3,000
Center Cost	$34,200	$31,400	$46,400

Allocated Factory Overhead @ 10%	3,420	3,140	4,640
Manufacturing Cost	$37,620	$34,540	$51,040
Molds to be produced	480,000	480,000	960,000
Rate of cost per mold	7.9c	7.0c	5.3c

Assumptions

Expenses (not intended to be accurate) for the operations of a year of 240 days of one shift with 20 molding stations producing molds at the rate of 100 molds per shift in Methods No. 1 and No. 2 and 200 molds in Method No. 3. Recording the costs as they might be accumulated by the accounting department and added to by the cost department for "cost finding".

(Because expenses actually occur on a per-day basis the proper or more correct divisor to use—especially in Method No. 3, to provide for normalization—would be about 75 to 80 per cent of the molds.)

Cost Program Essential

For the industry to capitalize on the potentials of the present castings market, much money for modernization is needed, either from retained earnings or from borrowing. When available money can be profitably employed to obtain the best in both technical and practical staff people and equipment to suit the methods and practices. Surely it is not out of place to say that poor quality and antiquated manufacturing methods coupled with poor working conditions and high costs will not capture these potential markets.

We should ask ourselves whether our castings are being priced by adequate and proper cost considerations. It might be well to be curious on this point where your own operations are concerned and perhaps also you might find that that curiosity would later be translated into dividends.

The operator who is always low when price bids are reviewed usually winds up as a candidate for the sheriff. But on the other hand, it is also possible to price yourself out of the market. There does not seem to be any easy way out. The big boss must see that costs are known and controlled and that this knowledge is used to intelligently improve the practices of the plant and the pricing policy.

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Jay Merrill, General Electric Co. In his talk the speaker noted that with the increasing importance of engineering functions in modern business a need for administration in engineering departments has developed. As long range plans are made for product design changes it is necessary to determine the engineering effort needed to achieve these goals. If product design planning is to be administered properly it is necessary to allocate the engineering activities quite specifically.

This problem is usually solved on the basis of judgment. In general the number of engineers needed can be predicted with fair accuracy. However, predictions of needs for services and materials are not as accurate. Consequently a system is needed to forecast how fluctuations in personnel effect purchases of materials and services.

Mr. Dolby outlined how figures from a 16-month period were correlated into an equation which allows the forecasting of purchase orders in relation to the amount of engineering required for a given project.

A Foundry Application of the Master Control System, N. P. Demos, General Electric Co., Schenectady, N. Y. The speaker described a master control system as an integrated, plant-wide, statistical quality control system for pin-pointing all out-of-control characteristics contributing to scrap or repair. Designed to be operated by manufacturing personnel, this information is pyramided to comprise the master control sheets for the next higher level of supervision.

One master control sheet is made for each worker or machine. From it can be determined daily and monthly production, daily and monthly breakdown on scrap rejections, and the percentage of daily scrap. Also included are process averages and percentages of production rejected for specific characteristics of the previous month.

A circling technique is used to indicate current and previous deficiencies. This enables a rapid anal-

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products and processes

and eliminates gas pockets. Does not break down in extreme heats. *Lubikold Co.*

Circle No. 46, Page 7-8

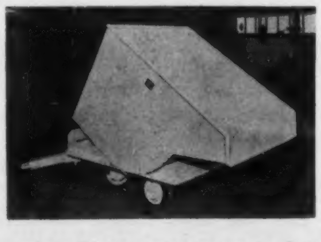
Casting cleaning machine uses hot detergent spray to remove chips from inner recesses and tapped holes of machined compressor parts. Rotating fixture suspends part in chamber. After spraying, castings are rinsed, rust preventive coating applied and steamed at 300 F to dry. Machine installed in Wisconsin foundry, cleans ten castings hourly. *Industrial Washing Machine Corp.*

Circle No. 47, Page 7-8

Drum head cutter, hand-operated, removes head in 2 min. without leaving saw-tooth edges. Prevents agitation of contents and sparking. *A. Schinker Mfg. Co.*

Circle No. 48, Page 7-8

Dump trailer, 1½-yard capacity, designed for heavy concentrated loads, will not tip. Safety lock allows easy dumping. Unit carrying up to 3 tons may be pulled by fork truck. Single front wheel gives maneuverability. Hopper measures 45x55x64 in. *Salem-Brosius, Inc.*



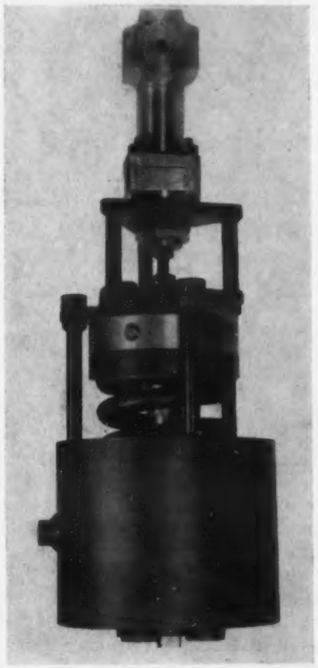
Circle No. 49, Page 7-8

Vibrators for moving, sifting, settling, or conveying granular materials operate on steam, compressed air, gas or vacuum. Ten sizes available capable of handling up to freight-car

loads. Inlet and outlet tapped with pipe threads. *Martin Engineering Co.*

Circle No. 50, Page 7-8

Valve actuator, all metal, used for pneumatic and hydraulic systems in highly corrosive atmospheres. Has 3000-lb. thrust. Available in three ranges of signal pressures; 3-15 psi, 6-30 psi, and 9-45 psi. The new actuators are available with suitable valves as complete control units, or as additions to existing valve installations. The line also includes models for use in less critical situations. *Fulton Sylphon Div., Robertshaw-Fulton Controls Co.*



Circle No. 51, Page 7-8

Die casting machine produces zinc, tin, and lead castings up to 2½ lb. Said to give hardware finish. Model brings line to 14 machines with capacities to 75 lb. *Cast-Master, Inc.*

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foundry trade news

The 1954 Census of Manufactures has been released by the Bureau of the Census, U. S. Department of Commerce. This is the 25th such census of the United States since the first study of manufactures in 1809. Statistics on iron and steel foundries as revealed by the census are as follows: Gray iron foundries – 1,414 plants, 133,914 employees, $572,676,000 spent for materials in 1954 products worth $1,418,947,000 shipped; Malleable foundries – 81 plants, 23,378 employees, $77,178,000 spent for materials in 1954, products worth $212,354,000 shipped; Steel foundries – 239 plants, 55,073 employees, $176,893,000 spent for materials in 1954, products worth $534,718,000 shipped.

National Malleable and Steel Castings Co. . . . Cleveland firm has reported that first quarter sales were $16,914,996, compared with $17,361,102 in the first quarter of 1956.

American Brake Shoe Co. . . has reported first quarter sales of $48,468,107, compared with $47,170,034 in the first quarter of 1956.

General Electric Co. . . will spend $1,600,000 in 1957 to expand and modernize five foundry sites in three states. Almost one million dollars will be spent at the GE Foundry Div. Schenectady plants. About $451,000 will be spent on the Applied Research & Development Laboratory, while $182,000 will be spent to set up a Specialty Castings Foundry. A $115,000 addition will be built onto the Schenectady steel foundry.

Union Carbide Corp. . . is the new corporate name for Union Carbide and Carbon Corp. Also changed is the name of Linde Air Products Co., Div., which becomes the Linde Co.

American Steel Foundries . . Chicago firm has reported net income of $3,535,866 on sales of $58,499,842 for the six months ending March 31. This compares with net income of $4,327,587 on sales of $57,941,451 in the same period of 1956.

General Steel Castings Corp. . . Granite City, Ill., firm reports sales of $11,797,421 for the first quarter of 1957 which compares with sales of $11,558,858 a year ago.

Bonney-Floyd Co. . . Columbus, Ohio, steel foundry has installed the first privately-owned industrial 24-million volt betatron in the United States. The machine will be used for x-ray inspection of heavy castings including pumps for nuclear reactors.

Washington University . . has added a foundry practice and alloy development laboratory to its School of Engineering in St. Louis, Mo., with the help of a $15,000 gift from General Steel Castings Corp., Granite City, Ill.

Standard Pattern Works, Inc. . . Cleveland patternmaker is now producing plastic patterns and duplicating models for Keller machines. Firm reports increasing demand for plastic pattern equipment.

National Lead Co. . . had net income of $14,772,815 for the first quarter of 1957, an eight per cent increase over 1956.

International Nickel Co. of Canada, Inc. . . reports that the nickel-producing capacity of the free world will rise 50 per cent by 1961.

Derby Castings Co. . . Seymour, Conn., firm has been appointed Connecticut distributor for the continuous cast bronze products of the American Smelting and Refining Co., Perth Amboy plant.

Shell Equipment Co. . . Connellsville, Pa., firm has announced appointment of the following representatives for its shell mold and shell core equipment: Cooper-Chapman Co., Toronto,

Ont.; Pennsylvania Foundry Supply and Sand Co., Philadelphia; John J. Elias, Uniontown, Pa.

Birdsboro Steel Foundry & Machine Co. . . reported record sales of $19,-051,512 in 1956. This represented a 58 per cent gain over 1955.

Sinclair - Collins Valve Co. - Valvair Corp. . . will move their engineering operations into a new building now under construction at Akron, Ohio.

Ferro Cast Corp. . .Santa Monica, Calif., investment caster has added a sulphur and carbon analysis laboratory.

Vesuvius Crucible Co. . . will spend $125,000 to expand its Swissvale, Pa., plant.

F. J. Stokes Corp. . . has opened a sales office in Atlanta, Ga., under the direction of W. J. Fisher.

Kaiser Aluminum & Chemical Corp. . . has reported 1956 net earnings of $42,349,131, a 17 per cent increase over 1955.

Joseph Dixon Crucible Co. . . has merged with the American Crayon Co., Sandusky, Ohio. There will be no change in the operation of the companies.

Laclede-Christy Div., the **McLain Fire Brick Div.**, and the **Mullite Refractories Division** of H. K. Porter Co., Inc., have been combined under one management and will assume the name of Refractories Division.

Allis-Chalmers Manufacturing Co. . . has established a wholly owned subsidiary in Australia, the Allis Chalmers Australia Pty. Ltd., and has purchased the assets of Thomas C. Pollard Pty. Ltd., Newcastle. The Pollard plant produces motor graders and will expand into the production of other machinery.

G. S. Plastics Co. . . Cleveland firm and associated companies supplying metal finishing materials have moved to new quarters at 15583 Brookpark Road, Cleveland.

Steel and Engineering Products Co. . . El Paso, Texas, has been named sales representative for J. F. Pritchard & Co., manufacturer of cooling towers and dehydration units.

Texas Materials Handling Co. . . Houston firm has been named sales and service representative for Lewis-Shepard Products, Inc., Watertown, Mass., producer of fork lift trucks.

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ysis of the problems. Results are posted in full view of the operator to give him knowledge of his operations and to enable him to take corrective action on his own.

Mr. Demos explained the use of a second master control sheet prepared for the foreman and all workers in his section. With this record a foreman can note jobs which are out-of-control. This sheet also carries information on foundry-wide problems in addition to those localized to one particular worker.

It is a simple matter for anyone in the pyramid to rapidly follow an out-of-control condition to a specific worker or machine.

Discussion of the paper advanced the suggestion that this system may be difficult to apply because of the time required to maintain the necessary records, but the author stated that the program may be tailored to any individual operation and that only one person would be required full time to maintain a complete system.

Quality Control in a Small Foundry, Jules J. Henry, Missouri Steel Castings Co., Joplin, Mo. According to the speaker, quality control is used in some form by all successful foundries. Often another name is used, and some shops are not aware that they are using such a program. Some form of control must be used to meet the customer's demands, to reduce scrap, and to produce economical castings.

Small foundries can not afford to spend time and effort on minor problems but must concentrate on basic operations. Small foundries with the aid of statistical quality control can study such basic fundamentals as sand, scrap, and departmental costs.

Mr. Henry said that all plants can benefit from keeping an up-to-date heat-record on melting operations. From these records, a chemical analysis line chart or bar graph can be constructed. Similar methods can be used to show moisture percentage in molding and core sand, sand strength, mold hardness, and metal temperature.

Charts based on the probability curve show whether variations are due to some assignable cause.

Regardless of what method is used the benefit of control is lost if corrective action is not taken when indicated.

In the discussion following the presentation, one foundryman commented that average scrap in his plant had dropped from six to three per cent since the introduction of a statistical quality control program.

Use of Fractional Factoral Designs in Sintering Experiments, C. J. Davis and J. D. Hromi, United States Steel Corp. Because of the increasing fineness of most available iron ores, a better understanding of agglomerating processes used to transform these fines into suitable blast furnace material has become very important. To meet the problem, the speaker explained that the sintering process is currently undergoing extensive experimental work at the United States Steel Corp. Applied Research Laboratory.

In view of the many different ores available and the numerous factors that are thought to influence the quantity and quality of sinter produced, varying of one factor at a time has been found to be inefficient. To reduce the amount of experimentation and to permit experimental conclusions to be stated with a known degree of uncertainty, fractional factorial designs have been used in the sintering experiments. Mr. Hromi described such an experiment in his talk.

In the discussion, comments from the floor emphasized that statistical methods can be used by foundrymen without advanced mathematics. By using simplified factorial design techniques, a foundryman can conduct research work on his foundry operations and product without the use of a research laboratory.

Statistical Technique for the Attainment of Optimum Processing Conditions, Alfred M. Schneider, American Cyanamid Co., Stamford, Conn. In order to assure optimum processing conditions some plant-scale experimentation is inevitable. The complexity and expense of such an operation calls for statistical designs, which allow the best

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use to be made of experimental data. When the important factors affecting the system are known, sequential experimentation will minimize the loss in output and the amount of general disorganization of the operation. If these factors are not known, analysis of existing plant data may be helpful. Alternatively large, highly fractionated factorial experiments must first be conducted to identify the important factors. Two recent developments in sequential experimentation are discussed.

Response-surface fitting entails approaching optimum conditions by a series of linear approximations. At, or near the optimum, more extensive arrays of experimental points allow approximation by a second order polynominal and the plotting of constant response contours. Thus it is possible to demonstrate the general nature of the system in the region of interest near the optimum and reveal the possible existence of equivalent responses from various combinations of process conditions. Simultaneous treatment of several responses affords information on optimal compromises in the face of competing requirements. Plotted response-surfaces may even be sufficiently good approximations of the physical system to shed light on its basic mechanisms.

Evolutionary operation allows effects due to slight changes in operating conditions to reveal a course for improvement. The actual experimental levels vary only slightly from the established operating conditions. A set of four or eight experimental combinations, constituting a full or fractional factorial set of experiments is pulsed through the system until a decision can be made on a new set of operating conditions, yielding a valid improvement.

Neither technique is a panacea for improving industrial processes, but both are valuable tools in the hands of the industrial statistician.

As the result of several questions from the floor, the author pointed out that quality control is intended to maintain certain specification limits. A number of operational

economies can be effected by lowering as many cost variables as possible and still remain within the specification limits.

Castings Engineering

An Automotive Engineer Views the Foundry, H. F. Barr, Chevrolet Motor Div., General Motors Corp., Detroit. Mr. Barr, chief engineer of the Chevrolet division, described the development and production of the V-8 cylinder block for the Chevrolet. While Barr stated that he admired the accomplishment of the foundries in producing the block, he stated that, as a designer, the work could not satisfy him. Too many changes must be made in a design to get it into production with current foundry practices, he said. The danger in this is that "if the engineering design group acceded to every request for a modification, we would end up with a product that only roughly approximates the original design—or maybe no product at all." Necessary developments for foundries include the production of castings with thinner walls, production within tighter tolerance ranges, elimination of draft, and the elimination of core supports and vent holes. The designer plays no favorite in the choice of a material or a process for making his part, Barr remarked. The designer intends to make the best product for the least money, and it may be gray iron or aluminum, stamped or welded, whichever offers the greatest economy.

Safety, Hygiene, and Air Pollution Control

Health and Safety in Foundries, Official Exchange Paper of the Institute of British Foundrymen, Sir George Barnett, H. M. Chief Inspector of Factories. The author's paper, which was presented by James Lake, Michigan Mutual Liability Co., surveyed the activities of law enforcement agencies and voluntary organizations in the United Kingdom concerned with both health hazards and safety hazards in foundries. The principal law enforcement agency is the 124-year old Factory Inspectorate which Sir George heads. The principal prob-

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lem in foundries, the author stated, is the control of environment. Iron, steel, and non-ferrous foundries in the United Kingdom each have committees studying this problem and Sir George reports that these groups have developed a number of original ideas and new developments. Among these have been the development of a quick and simple method of comparing the conditions in different foundries so that a standard condition could be found, a study of the aerodynamics of ventilation systems for shakeouts, and development of ventilation for portable grinders and chisels.

Legislation Affecting Foundries, H. J. Weber, American Foundrymen's Society, Des Plaines, Ill. Mr. Weber's paper discussed the effects on the foundry industry of the A.S.M.E. Model Smoke Law with special emphasis on the error of applying an adjustment to 12 per cent carbon dioxide, a correction for stack temperatures, and the Ringelmann chart to metal melting operations.

The pitfalls of evaluating air pollution at ground level without at the same time placing limits on stack emissions were pointed out using the Oregon air pollution law as an example.

The difference between an impractical law and one using the cooperative approach was shown by contrasting the Chicago zoning ordinance with the Allegheny County air pollution law.

The Foundry Health and Safety Act of the Province of Ontario was selected as an example of the tendency of some jurisdictions to place special emphasis on the foundry industry. While other types of industry in Ontario come under the general factory act, the Province of Ontario is preparing a special health and safety act for foundries and requiring stricter control of emissions from foundries than from other industrial plants.

The author recommended that foundrymen resist unfair and unreasonable legislation which places them at a competitive disadvantage. But should cooperate where legislation is fair and justified.

In the remarks following the paper, some foundrymen used vigorous language to describe the lack of interest shown by many in safety and air pollution.

Loss of Hearing May Cost You Money, Dr. P. J. Whitaker, Allis-Chalmers Mfg. Co., Milwaukee. Dr. Whitaker stated that air conduction audiometric tests only should be given in foundry plants. Bone conduction tests should only be given in special cases on specific order from the diagnostic physician. Because many men are hired into foundries who have a hearing loss at the time of first employment, Dr. Whitaker warned that preemployment audiograms must be given. If not, the foundry will one day buy the hearing loss that the claimant actually had when originally employed.

Radiation Is Hazardous, F. A. Van Atta, National Safety Council, Chicago. Dr. Van Atta stated that even the smallest sources of radioactive material are dangerous and often, if exposure occurs, effects may not be noticeable for many years. Small x-ray machines and radiation scatter from them are also dangerous. Regardless of manufacturer's claims Dr. Van Atta stated that all equipment should be monitored before use and whenever any change, however minor, is made.

Education

The Coming Foundry Manpower Shortage, J. S. McCauley, U. S. Department of Labor, Washington. D. C. Mr. McCauley discussed a survey of skill requirements and training needs in semi-production, specialty, and job foundries which was conducted in January 1957 by the U. S. Department of Labor, in cooperation with an advisory committee from the industry.

Manpower data provided by more than 100 foundries indicate that additional training should be developed, especially in plants that are not training workers at present, Mr. McCauley stated. During the next few years a considerable number of workers need to be trained as replacements for losses due to death and retirement. Foundry workers are, on the average, older than workers throughout industry.

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local foundry news

Honor Northeastern Ohio Apprentice Contest Winners at April Meeting

Chapter stresses importance of developing talent in plant

Training and education in the foundry industry were featured at the April meeting of the Northeastern Ohio Chapter in Cleveland. Apprentice winners were announced and prizes awarded.

John Camdem, Ford Motor Co., Cleveland, discussed the value of apprenticeship. He stated that there is a vital need in the industry for companies to maintain and improve their competitive advantage by building skills within their organization.

Walter Hehr, Mohawk Pattern Works, Inc., Cleveland, presented checks on behalf of the Pattern Manufacturers Group, Associated Industries of Cleveland to the first, second, and third place winners. Winners in wood patternmaking were Douglas Petery, Cove Pattern Works; Edward Lamparyk, Modern Pattern Co.: and W. A. Burd, Ford Motor Co. Metal patternmaking winners were K. C. Lapchynski, M. E. Salsbury, and A. R. Snelly, Jr., all of Ford Motor Co.

Emil J. Romans, National Malleable & Steel Castings Co., Cleveland, presented checks to other winners. Andrew Gerda, Wellman Bronze & Aluminum Co., was the first place winner in nonferrous molding. Ferrous molding winners were Junior Samples, Glen Mohr, and Carl Linger, all of W. O. Larson Foundry Co.

Frank Cech, Cleveland Trade School, Cleveland, past National Director of the American Foundrymen's Society, discussed the various educational programs sponsored by the National Headquarters' office. Others representing the Headquarters' office at the meeting were, AFS National Director, W. C. Gilchrist, Cooper-Bessemer Corp., Mount Vernon, Ohio, and past AFS President, Frank J. Dost, Sterling Foundry Co., Wellington, Ohio.

Utah Members Make Plant Tour

Approximately 60 members of the Utah Chapter toured the Columbia-Geneva Steel Works of U. S. Steel during April. Officers and directors were elected following the tour. No further technical meetings will be held until next fall. Tentative plans have been made for a summer party or picnic.

Become Familiar with Alloying Thompson Tells Pennsylvanians

Foundries must become familiar with alloying and the use of tracer elements to improve metal properties, Dr. Robert Thompson, Research Div., GMC, told the members of the Northwestern Pennsylvania Chapter at the March meeting. The speaker said that new techniques must be developed for sand casting or lose ground to die casting and other fabricating techniques. Movies were shown illustrating how fluids enter gating systems in transparent plastic molds.

Northeastern Ohio Chapter Hears Talk by Steinbach

Castings will be consumed at an increasing rate because of the growth in population, Frank G. Steinbach, Penton Publishing Co., told the Central Ohio Chapter at its March meeting.

However, he stated, foundries must be alert to new developments in alloys and processes to remain competitive. The speaker recommended improved production equipment, better quality control, expanding research activities, more intensive selling, and close contact with engineering schools for the castings industry to expand its growth.

Shipley to Address F.E.M.A.

Frank W. Shipley, American Foundrymen's Society President, will be the featured speaker at the 39th annual meeting of the Foundry Equipment Manufacturers Association, Inc., to be held October 17-19 at White Sulphur Springs, W. Va. Mr. Shipley will talk on *"What Foundry Management Expects of the Foundry Equipment Industry."*

Chairmen Named for Niagara Frontier Regional Conference

Chairmen have been named for the divisions of the 1957 Niagara Frontier Regional Conference to be held October 24-25 at the Statler Hotel, Buffalo, N. Y. Leonard Greenfield, Samuel Greenfield Co., will serve as general chairman.

MILWAUKEE CHAPLET PHOTO

Senior metallurgical students from the University of Pittsburgh and Carnegie Institute of Technology were special guests at the April meeting of the **Pittsburgh Chapter.** Featured speaker was W. O. Philbrook, Carnegie Institute of Technology, who discussed *"The Freezing of Steel Castings."* Among the old-timers attending were left to right: Frank B. Godard, U.S. Graphite Co.; David J. Salvi, Pittsburgh Steel Foundry Co.; and A. J. Coulson, United Engineering & Foundry Co.

Five speakers addressed the April sectional meeting of the **Wisconsin Chapter.** Shown left to right are: A. B. Steck, consultant, *Mold-Metal Interface Reaction:"* . G. Winget, Reda Pump Co., *"Melting of Gray Iron in a Reverbatory-Type Furnace;* D. L. La Velle, Kaiser Aluminum & Chemical Sales Co., *"Aluminum Casting Defects and their Correction;"* Gilbert Willms, Caterpillar Tractor Co., *"Your Pattern Shop Problems;"* C. A. Sanders, American Colloid Co., *"Malleable Molding Sands."*

Approximately 100 foundrymen attended the April meeting of the **Quad City Chapter** in Rock Island, Ill. Shell molding and shell cores were discussed by Albert Doerr, Midwest Foundry Co., Coldwater, Mich. Mr. Doerr illustrated his talk with slides, molds, and castings. At Midwest Foundry Co. a 5 per cent resin plus 100 grain fineness sand mix is used to produce 1000 shells per machine in 24 hours. The speaker said casting yield is greater in shell molding than in green sand. Sand costs, he stated are about $30 a ton. Mr. Doerr is shown on the right; L. H. Brogley, chapter chairman, is on the left.

Texas Chapter members during April attended the Harry W. Dietert Sand School at the University of Houston, Houston, Texas. C. A. Harrison, Globe Machine & Foundry Co., Amarillo, Tex., travelled 650 miles to attend the school. He is shown on left. At right is Victor M. Rowell, Harry W. Dietert Co., who conducted the school.

Reports of fire hazards in magnesium foundries are greatly exaggerated, M. E. Brooks, Dow Chemical Co., Bay City, Mich., told members of the **Oregon Chapter** at the April meeting. Mr. Brooks, shown in photo, said that the incidence of time loss accidents in magnesium foundries is much lower than foundries in general. Current publications of the American Foundrymen's Society were given to the Portland Public Library at the meeting.

Detroit Chapter apprentice winners awards were made at the March meeting. Shown in the photo are chapter members and the winners. Left to right are: R. W. Schowalter, Dodge Foundry; William Kuschel, first place winner in the metal division of the national apprentice contest; Gerald Penner; Cecil King, Dodge Foundry; Adam J. Kravetz; James Smith, Jr.; Sheldon Haglund; and Clifton Evans, third place winner in the metal division of the national contest. Also in March the Detroit Chapter members were guests of the Great Lakes Steel Corp. and the Hanna Furnace Co. They toured the Great Lakes steel mill.

Success of the first Ladies Night Party held in March by the **Northeastern Ohio Chapter** has led to the tentative scheduling of a similar event for next year. Approximately 210 persons attended.

Health and hygiene and how they affect foundry costs was explained at the April meeting of the **Saginaw Valley Chapter** by W. G. Ferrell, Auto Specialties Mfg. Co., St. Joseph, Mich. Mr. Ferrell said that the cost of accidents had become increasingly costly and that complete health records must be maintained on each employee. He added that compensation claims can be made as long as 25 years after termination. Mr. Ferrell explained how his company improved their safety program so that they were awarded the National Safety Award in 1933 and 1934. Shown in photo left to right are B. D. Roush, Almont Mfg. Co., Imlay City, Mich., technical chairman; speaker Ferrell; and J. E. Bowen, chapter chairman, Chevrolet Grey Iron Div., GMC, Saginaw, Mich.

Erie School to Have Foundry

Memorial Technical High School, Erie, Pa., has a foundry classroom included in its plans. Ground was recently broken for this school. Northwestern Pennsylvania Chapter members on the foundry advisory committee of the school include Earl M. Strick, Erie Malleable Iron Co., John Clark, General Electric Co., Robert Johnson, Bucyrus-Erie Co., and Charles Gottschalk, Cascade Foundry, all of Erie, Pa.

Timberline Chapter Conducts Round Table Scrap Discussion

A round table discussion on scrap was held at the April meeting of the Timberline Chapter in Denver, Colo. William Sigmount and John Polfeldt, General Iron Works, Denver, told of general foundry practices at General Iron Works and then led the discussion on defects causing scrapping of castings.

Rolla Chapter Elects Two

Robert L. Wright has been elected chairman and Henry A. Root vice-chairman of the Missouri School of Mines AFS Student Chapter, Rolla, Mo.

Sanders Speaks at St. Louis

Choosing the correct sand for castings was outlined at the April meeting of the St. Louis Chapter by C. A. Sanders, American Colloid Co., Chicago. "Your choice of molding sand can make the difference between profit and loss," Sanders told the group.

Dance at Western New York

Western New York Chapter held its annual spring dinner dance at the Buffalo Trap and Field Club in April.

Huge X-Ray Installation To Test Castings for Navy

Castings for constructing Naval missiles or nuclear-powered vessels will be tested with a new 2 million volt x-ray installation recently dedicated at the U. S. Navy Magazine, Port Washington, Concord, Calif. This will make possible the nondestructive testing of vital defense materials and structures.

Castings will be inspected with the unit before delivery to shipyards. Services of the x-ray plant will be extended to commercial firms holding government contracts as well as to other agencies of the Department of Defense.

The x-ray unit, built by General Electric Co., is housed in a concrete building large enough to contain a railroad car. Closed-circuit TV facilities will permit remote observation of internal moving parts.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 7-8. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

AFS Releases Bibliography on Cupola Operation Book

An annotated bibliography of cupola operations has been prepared by the staff of the American Foundrymen's Society to supplement the present edition of THE CUPOLA AND IT'S OPERATION. The bibliography has been categorized in general in accordance with the table of contents plus additional categories thought to be necessary. It covers 1953-55 inclusive. An annoted bibliography supplement will be prepared for each two-year period.

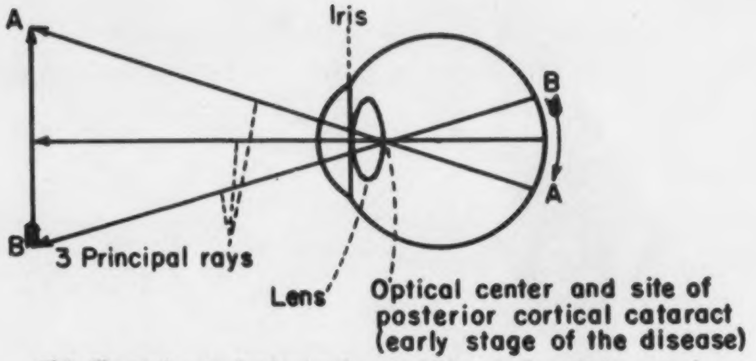
Bibliographies are on sale at $2 for members and $4 for non-members Write to Book Department, American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill.

AFS Publishes Translation of German Die Cast Book

The first book on die casting published by the American Foundrymen's Society is now available. DESIGN OF DIE CASTINGS by G. Lieby has been translated from German. The paper-bound book contains 208 pages and consists of eight chapters dealing with such subjects as methods and processing principles; fundamental features of die cast products; die casting materials and their application; low and high melting alloys; design principles; and determination of tolerances.

The book is intended to familiarize the designer with the properties, advantages, and limitations of the die casting process. The complexity of the field leaves open the possibility of a difference of opinion on some points. Due to the many intricate shapes of castings, resolution of some questions between the designer and the producer cannot be fully attained. In many cases, however, the rules and examples presented in the book will serve as a guide in good die casting design.

The book contains charts and graphs and is illustrated with photographs and drawings. It is available to members for $5.25; non-members, $8. Write to Book Department, American Foundrymen's Society, Golf and Wolf Rds., Des Plaines, Ill.



This illustration is the basis of a myth that Author Weber attacks.

the SHAPE of things

safety, hygiene, air pollution

by Herbert J. Weber

Infrared— Does It Cause Cataract of the Eyes?

Recently a cutter working with an oxyacetylene cutting torch claimed loss of vision due to repeated exposure to excessive light from the torch. In the case of Ingalls Shipbuilding Corp. v. King, the Mississippi Supreme Court ruled that on the basis of "expert" testimony, the claimant's cataracts were either caused by the absorption of infrared rays, or that the cataracts were aggravated by such absorption.

Nearly half a century ago, cataract of the eye resulting from infrared radiation was made compensable in England. Since the various workmen's compensation laws of the United States had their origin in British common law, many states included infrared cataract in their compensation schedules. The English schedule was based on a study of cataract in a community where the chief industry was glassmaking and the label "glassworkers' cataract" was wrongly attached to the condition. The myth of infrared cataract has persisted to the present time even in the United States.

An article published in the British Medical Journal, entitled "Bottle Finishers Cataract" by William Robinson, M. D., was offered as evidence that intense infrared radiation was the causative agent. Robinson found in that community that the cataracts occurred on the posterior surface of the lens and offered the following explanation:

"The nodal point (which practically corresponds to the optical center) is situated at the exact spot where the cataract begins, and here all the principal rays of the various pencils of rays falling on the lens cross and pass without refraction, so that this point of the lens receives the brunt of all the direct rays, harmful by their intensity and heat from the furnace, and is therefore the point first to suffer injury." A facsimile of Robinson's illustration is shown in the accompanying drawing.

It is apparent that the illustration and the concept are in error from the standpoint of elementary optics. The rays of light claimed by Robinson as causing cataract never cross at the posterior surface of a convex lens but at a point near the physical center, as one knows from fundamental physics. Therefore, if infrared causes cataract for the reasons adduced by Robinson, the point first to suffer injury would be the physical center of the lens. However, Robinson indicated quite clearly that cataracts occurring at the physical center of the lens are not those found in persons exposed to infrared but are of the character of those found in older people. It seems more logical to state that infrared cataract would appear at or near the front of the lens where absorption of the rays is greatest, but Robinson stated that such cataracts are due to old age.

The harm caused by Robinson's unscientific paper may never be completely undone in spite of the scholarly refutation by Dunn*, and later by Keatinge, et. al. of this country. To quote from Dunn:

"In direct opposition to Robinson's data are investigations conducted by Simeon Snell, Professor of Ophthalmology at the University of Sheffield, England. Snell's report was presented without benefit of *optical conjecture* (italics ours) and agrees . . . . with the personnel records of several of the glass manufacturers who testified as to the failure of the disease to appear in their factories.

". . . . We cannot overlook the fact, however, that it was on Robinson's presentation that the committee recommended to Parliament the disease be scheduled as occupational in origin, and this point of view has subsequently been copied into most of our state workmen's compensation laws."

Infrared as a cause of cataract of the eyes has never been demonstrated even in the glassmaking industry where exposures to infrared radiation are more severe than in the foundry or ship building industry.

But, as is seen, the myth is still perpetuated by "experts."

*DUNN, KARL L., "Cataract From Infrared Rays" Ind. Hyg. and Occ. Med., May 1949, pp 166-180.

afs chapter meetings

JUNE

Central Illinois . . June 8 . . 497th Engineers' Cabin, Groveland, Ill. . . *Annual Stag, Clam Bake and Barbecue.*

Central Michigan . . June 8 . . Marywood Country Club, Battle Creek, Mich. . . *Annual Outing.*

Central Ohio . . June 22 . . Timberlane Park, Columbus, Ohio . . *Annual Picnic.*

Chesapeake, Southern Section . . June 7 . . Virginian Hotel, Lynchburg, Va. . . K. G. Presser, Forest City Foundries Co., *"Gating and Risering."*

New England . . June 11 . . Springfield Country Club, Springfield, Mass. . *Annual Meeting and Outing.*

Northeastern Ohio . . June 22 . . Twin Lake Country Club, near Kent, Ohio . . *Annual Picnic and Golf Outing.*

Northern Illinois-Southern Wisconsin . . June 11 . . Beloit Country Club, Beloit, Wis. . . *Annual Picnic.*

Oregon . . June 19 . . Heathman Hotel, Portland, Ore . . *Casting Clinic and Business Meeting.*

Penn State Regional Foundry Conference . . June 20-22 . . Penn State University, University Park, Pa. *Sponsored by Rochester, Pittsburgh, Metropolitan, Eastern New York, Western New York, Northwestern Pennsylvania, Central New York, Chesapeake and Philadelphia Chapters and Penn State University Student Chapter of AFS, and Reading Foundrymen's Association.*

Saginaw Valley . . June 1 . . I.M.A. Lodge, Potter's Lake, Flint, Mich. . . *Annual Outing.*

Southern California . . June 7 . . Rodger Young Auditorium, Los Angeles . . *Past President's Night.*

Tri-State . . June 28 . . Woodland Country Club, Tulsa, Okla. . . *Annual Spring Party.*

Western New York . . June 22 . . Sturm's Grove, Buffalo, N.Y. . . *Annual Picnic.*

JULY

Wisconsin . . July 26 . . Tuckaway Country Club, Milwaukee . . *Annual Outing.*

MORE FACTS on all products, literature, and services shown in the advertisements and listed in Products & Processes and in For the Asking can be obtained by using the handy Reader Service cards, pages 7-8.

foundry facts

Materials Handling

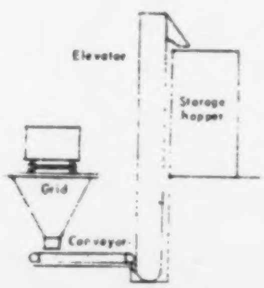
These sketches provide the foundry operator with a wordless review to most of the alternative materials handling methods which may be applied to major foundry operations. The sketches were originally prepared for a paper presented to the First European Seminar on Foundry Productivity by G. W. Nichols. The paper was published by the Organization for European Economic Cooperation.

Handling of Sand from Stockpile to Storage

Man and wheelbarrow.

Dump truck.

Freight car to conveyor.

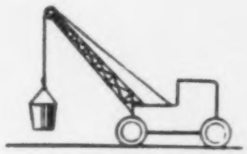


Conveyor under freight car.

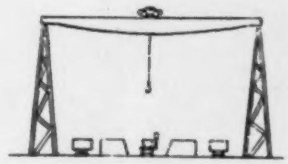
Methods of Handling Foundry Stockyard Material

Wheelbarrow.

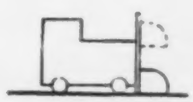
Hand-operated truck.



Portable crane.



Overhead crane.



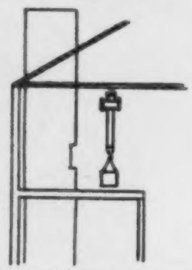
Dump bucket.

Fork lift truck.

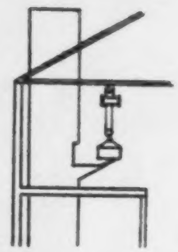
foundry facts

Materials Handling

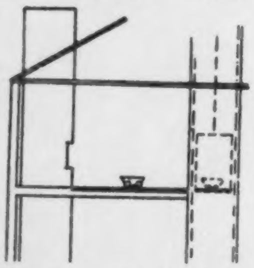
Six Examples of Handling Cupola Charges



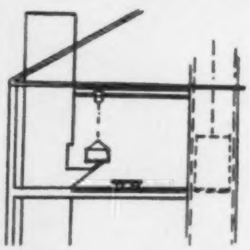
Electric hoist, monorail for hand charging cupola.



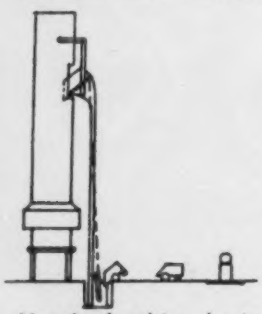
Electric hoist, monorail with mechanical charging.



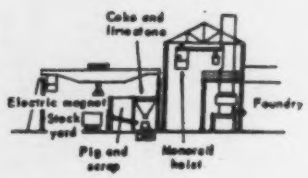
Elevator with 4-wheel truck for hand charging.



Elevator, truck and hoist for charging.



Vertical skip hoist for mechanical charging.



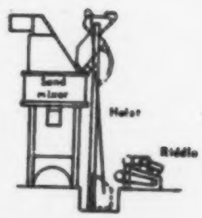
Underslung crane with mechanical charger.

Sand Handling and Preparation Procedures

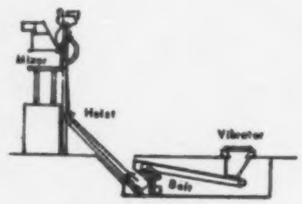
Hand riddling.

Sand thrower.

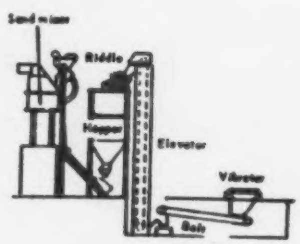
Portable muller.



Skip hoist at muller.



Conveyor at muller.

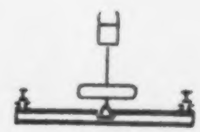


Elevator at muller.

Casting Removal

By hand and wheelbarrow.

Electric hoist and crane.



Air hoist and vibrator.

obituaries

Andrew M. Ondreyco, director of AFS from 1951-1954, died April 15. He had been sales engineer for General Metals Corp., Oakland, Calif. for the past five years.

A 1923 graduate of Carnegie Institute of Technology, and a veteran

A. M. Ondreyco

of service with the U. S. Forces in France in World War I, Mr. Ondreyco became associated with Westinghouse Air Brake Co., completing his apprenticeship there and working as metallurgist for nine years. He was associated with Meehanite Metal Corp. as foundry engineer and metallurgist in the United States and Australia, and was plant manager for Vulcan Foundry Co. for ten years.

Mr. Andreyco was active in the formation and work of the Northern California Chapter of AFS, as well as the Pittsburgh Foundrymen's Association.

William C. Hartman, special engineer for Bethlehem Steel Co., Bethlehem,

W. C. Hartman

Pa., died April 27.

Mr. Hartman was a graduate of Lehigh University and was associated

with Bethlehem Steel Co. since 1917, with the exception of 3 years, 1923-1926, which were spent with Union Tool Co., Torrance, Calif. He was a member of AFS for many years, serving as chairman of the Philadelphia Chapter in 1939-40.

John F. Livingston, assistant plant engineer, Crouse-Hinds Co., Syracuse, N. Y., died recently.

He had been active for many years

J. F. Livingston

in the Central New York Chapter of AFS, serving as director and chairman of that chapter for many years.

G. Donald Spackman, 61, vice president in charge of operations of Lukens Steel Co., Coatesville, Pa., died April 14. His career with that company spanned forty years.

Mr. Spackman was graduated from Swarthmore College in 1917 and was awarded a degree in mechanical engineering in 1924. He was active in community affairs and was a member of the American Iron and Steel Institute.

George A. Fyrberg, production manager of Norton Company's Abrasive Division, Worcester, Mass., died suddenly April 6. He joined Norton Co. in 1915 as a wheel finisher in the truing department and was appointed to his latest position in 1952.

Looking . . .

. . . for new production ideas? Circle numbers on Reader Service cards (page 13-14) to get more information on products and services described in Products & Processes and For the Asking.

patent review

Melvin Nord, *Dr. Eng. Sci., LL. B*
Consultant in Law and Engineering

Cleaning Foundry Sand

New method and apparatus for cleaning sand is particularly effective for removing carbon adhered to particles of used foundry sand, permitting reuse as foundry or core sand.

The sand is screened in the presence of water to remove oversized adventitious material. The sand is then fluidized with a jet of water and passed into relatively quiescent settling zones in which loose carbonaceous impurities are floated off. The residual sand is then transferred to a first attrition chamber in which it is fluidized with water by impelling means hurling the sand particles against each other. The sand is then transferred to a further settling zone in which additional carbonaceous particles are floated off, then to a second attrition chamber, and a final settling zone. 2,766,496, *issued Oct. 16, 1956 to F. L. Ward and assigned to Robert W. Ward Co.*

Core and Mold Sand

Sand for molds or cores is combined with a binding agent which is a polymer of an acrylic acid or an ammonium salt of an acrylic acid. The resulting composition without further additives, except moisture and, if desired, a small amount of a lubricant such as kerosene, produces cores and and molds of extremely high green strength, baked strength, hardness and collapsibility, coupled with excellent permeability and excellent surface smoothness. 2,765,507, *issued Oct. 9, 1956 to R. J. Wolf, and R. E. Score, and assigned to B. F. Goodrich Co.*

Flux for Ladle Treatment

Gray iron with improved properties results from treatment of molten iron in the ladle with an exothermic flux. The object is to produce the same desirable results as are obtained by treatment with calcium silicide at 3000 F., by treatment in the ladle at normal ladle temperatures, — namely, compacting of the graphite form which changes the graphite in the solidified iron from flake form to at least partially nodular or spherulitic form.

A mixture containing 50-90 per cent by weight of calcium silicide, 8-25 per cent sodium nitrate, and 2-34 per cent of rare earth oxides is used. There must always be an excess of calcium metal above that required to react with the sodium nitrate according to the following reaction:

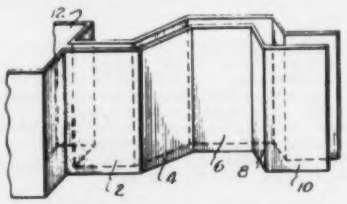
$$2\,Ca + NaNO_3 \rightarrow 2\,CaO + NaO + N_2$$

The heat evolved in this reaction and the other ensuing reactions raises the ordinary ladle temperature from the range 2400-2700 F. up to about 3000 F., whereupon the excess calcium-silicon alloy becomes effective.

The amount of flux used is about 2-3% of the weight of the molten iron. 2,765,225, *issued Oct. 2, 1956 to Sam F. Carter, Jr., Charles K. Donoho, and Ray A. Dyke, Jr., and assigned to American Cast Iron Pipe Co.*

Runners Cut Turbulence

Metal is led into a mold in a non-turbulent, non-foaming condition when this new runner system is used. In general, the object is accomplished by causing the molten metal to flow



Runner dampens force of flow.

through a series of open channels of successively increasing size, as shown.

The metal flows from a preliminary runner 12 formed according to the following formula:

$$f = 0.0226 \times \frac{m \times V}{h^n}$$

where f is the runner cross-sectional area, h is the distance of fall of the metal, V is the volume of molten metal flowing through the system per second, m is a coefficient between 1 and 5, and n is an exponent between 0.5 and 1.5. 2,763,905, *issued Sept. 25, 1956 to Fredrich Nielsen.*

Classified Advertising

For Sale, Help Wanted, Personals, Engineering Service, etc., set solid . . 25c per word, 30 words ($7.50) minimum, prepaid.

Positions Wanted . . 10c per word, 30 words ($3.00) minimum, prepaid. Box number, care of **Modern Castings,** counts as 10 additional words.

Display Classified . . Based on per-column width, per inch . . 1-time, $18.00; 6-time, $16.50 per insertion; 12-time, $15.00 per insertion; prepaid.

Help Wanted

FOUNDRY ENGINEER

A major manufacturing firm, long established in Chicago, has an unusual opportunity for a foundry engineer.

The work will involve assuming responsibility for engineering improvements in foundry units. Applicant must be capable of plant wide planning, equipment selection and layout for efficient modern foundry operations. This is a permanent position and pays a salary commensurate with ability.

In your resume, state education, experience—including size and type of operation and degree of responsibility, and salary expectations.

Box D56, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

GENERAL FOREMAN

for non-ferrous foundry in Southern California plant of national company. Must have ability to organize and supervise with a minimum of 5 years experience in high production non-ferrous foundry. Position offers excellent future in rapidly expanding company. Complete benefit program including profit-sharing. Send complete resume including salaries on previous positions, references, and how soon available. Box D50, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

FOUNDRY FOREMAN to take charge of molding floor for medium sized stainless foundry. Must know gating, risering, sand control and management of men. Age under 40. Box D43, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

PRESIDENT

Exceptional opportunity for top notch executive to head successful and rapidly growing manufacturer of foundry supplies. Present organization provides excellent support in administration, production, finance, engineering and research.

Strong background and successful record in marketing, especially sales management, is essential. Formal or practical training in metallurgy, foundry practice, or chemical engineering is important.

Desired age: 38-55 years.

Compensation: We expect to pay an excellent salary, plus profit-sharing and stock option. All replies will be treated confidential. Please forward resume to

Box D58, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

FOUNDRY
Supervisor or Engineer
Must Be Fully Qualified To
Control Quality For Gray
Iron Foundry of Long Established
Progressive Manufacturing Co.

AMERICAN MANUFACTURING CO. OF TEXAS
Box 7037, Ft. Worth, Texas

MECHANICAL ENGINEER with foundry background for production supervision in HEAVY CENTRIFUGAL FOUNDRY NON-FERROUS. Reply to Box D54, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

FOUNDRY METALLURGISTS & ENGINEERS

Opportunity is knocking for a gray iron foundry engineer under 40 who

1. Would like complete charge of metallurgy, sand control, and plant engineering with a medium sized gray iron jobbing foundry beautifully situated in New England.
2. Wants to grow with two young men in developing a well established business into an outstanding foundry.

This is a rare opportunity for a well trained man to fit into a situation that is challenging, stimulating and rewarding.

BOX D57, MODERN CASTINGS
GOLF AND WOLF ROADS **DES PLAINES, ILL.**

NEW FOUNDRY SEEKING MANAGEMENT-MINDED MEN

A major company must staff a new steel foundry in Texas with qualified individuals interested in their own future and in the challenge of being part of the development of a modern facility. Interested parties should forward a complete resume of their background and experience. Strictest of confidence will be respected for all answers. Positions open at the present time include:

General Foremen
Melting Foremen
Mold Foremen
Core Foremen
Cleaning Foremen
Pattern Shop Foremen
Casting Engineers
Equipment Engineers
Metallurgists
Chemists
Chemist Technicians
Industrial Engineers

Box D51, MODERN CASTINGS
Golf and Wolf Roads
Des Plaines, Ill.

CHEMIST. Experienced chemist to do research and development work on core oils and allied foundry items. Location Michigan. Box D49, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

FOUNDRY FOREMAN, non-ferrous. Opportunity for an experienced foreman to take charge of our foundry in Milwaukee. This is a modern foundry manufacturing brass plumbing products. Well established company with excellent reputation. Box D55, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

Positions Wanted

Responsible position with progressive firm. Thirty years experience; 15 years pattern supervision and engineering field of pump valves and fittings. Strong modern foundry practice. Box D53, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

STEEL FOUNDRY METALLURGIST. 35 years experience desires position in the Chicago-Milwaukee area. Extensive background in metallurgy and general foundry practice. Seeks management, metallurgical or sales with progressive organization. Recognized standing in the industry. Presently employed. Box D52, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

DIRECTOR OF METALLURGICAL LABORATORY, Ph. D., 34, 10 years in casting control, research and development. Experience in setting up and carrying out an effective research program. Prefer West Coast. Box D45, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

Assistant Sales Manager—Experienced in investment casting sales, estimating, quota determination, representative selection and advertising. Young graduate engineer seeks greater managerial responsibility. Write Box D59, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

Foundryman. Age 35 employed supervisor production shop. National Manufacturer steel, gray iron, brass. Desires similar position Los Angeles area. Box D60, MODERN CASTINGS, Golf and Wolf Roads, Des Plaines, Ill.

For Sale

MOLDING MACHINE: Herman 6000# capacity, jolt-roll-draw in operating condition. asking $2,900.00 FOB Pottstown Machine Co., Pottstown, Pa. (Phone 37, H. H. Houston)

FURNACES FOR SALE

10 used Heat Treating Furnaces, and two 7-ton gantry cranes, good condition, priced to sell.

BAER STEEL PRODUCTS. INC.
Box 1428
Boise, Idaho

Engineering Service

SESSIONS ENGINEERING CO.

Consulting Foundry Engineers
Modernization, Processing Layouts
Cost Reduction   Quality Control
Product—Machine Control
Architectural Design
One North La Salle St., Chicago 2, Ill.

WESTOVER CORPORATION
Consultants
Exclusively serving the foundry industry since 1930
Mechanization—Modernization
Labor Relations—Incentives—Systems
Cost and Production Control
Plant Layout—Management
3110 W. Fond du Lac Ave.,
Milwaukee 10, Wisconsin

Now Where Was That?

■ You will have no trouble locating articles in back issues if you write for the free index to 1956 issues of MODERN CASTINGS.

questions and answers

Misery loves company so why not share your castings problems with us? MODERN CASTINGS invites you to "stump the experts" with tales of gremlins that are haunting your scrap piles. If any of you readers have better answers to the questions below, write the editor.

smoke signals

Q. Is there any significance to the color of smoke emission from a cupola?

A. Yes, the color of smoke emission is a reliable indicator of the coke bed conditions. If smoke is brown, the bed is falling; buff colored smoke indicates a rising bed; white smoke is desirable because it shows bed is staying constant. For good control of iron and slag the cupola bed height should be maintained constant. This is not always easy since the limestone in the charge is constantly dissolving the silica refractory lining causing the effective diameter to be constantly changing.

Of course too much of any color of smoke will get you in trouble with the local air pollution ordinance!

permanent mold spray

Q. Would you please recommend a refractory mold wash for coating permanent metal molds used for centrifugal casting of cylinder liners?

A. A successful wash or spray for this purpose consists of silica flour suspended in water to which two to three per cent bentonite and sodium silicate have been added. The bentonite tends to keep the silica flour in suspension and the sodium silicate serves as the binder. Avoid using too much bentonite and sodium silicate. Excessive amounts of either tends to increase the shrinkage of the coating, causing it to curl and come loose rather than adhere to the mold.

After the wash has been applied and dried, some operators find it beneficial to coat the mold with a deposit of soot from a smoky acetylene flame just prior to pouring the metal.

tellurium in iron

Q. What effect does tellurium have on cast iron?

A. Tellurium is the most potent chill producer that can be added to gray iron. Even as little as 0.003% added to iron will show a marked change in the chilling propensity of the iron. Once its effects are well calibrated for a particular iron it can be a very useful alloying agent for producing castings requiring a controlled chill depth. For this reason it is used extensively by the producers of chilled iron railroad car wheels and rolling mill rolls.

By incorporating tellurium in a core wash, localized "spot" chilling has been accomplished. The fumes are readily absorbed by the skin and in breathing. Evidence of this absorption is demonstrated by a garlic odor on the breath and in perspiration.

shell molding hazards

Q. What health hazards should be guarded against in the shell molding process?

A. Several of the materials used in shell molding deserve mention as potential hazards. The resin binders can be primary skin irritants if they are not completely polymerized. Carbon tetrachloride is used as a dispersal agent for silicone release materials. The vapors from carbon tetrachloride are very poisonous and easily absorbed by the mucous membranes and lungs. Heat decomposes it to form phosgene —a deadly gas.

The hydrolyzing types of silicones are highly corrosive and extremely irritating. Eyes can be seriously damaged or blinded and the skin can be severly burned by direct contact with this type. Use a safe type such as methyl, mixed methyl, and phenyl-polysiloxane types.

The recent practice of coating sands with resins dissolved in alcohol offers the added risk of explosion during sand mulling. A good exhaust system and elimination of any possible source of ignition are an absolute must on this operation.

advertisers and their agencies

This index is published as a convenience to the readers. While every care is taken to make it accurate MODERN CASTINGS assumes no responsibility for errors or omissions.

modern castings

Circle No. 192, Page 7-8